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The Importance of Trade Expansion.

DURING the past few weeks there has been another of those periodical epidemics of speeches and newspaper articles on peace and goodwill in industry which always occupy so much thought without seeming to yield any tangible result. The discussions are strangely reminiscent of the war years, when in the heart of London something like mothers' meetings were held whereat, after tea and cake, men and women discussed the problems of industry in a comfortable drawing-room atmosphere. We suppose it is because we have had to listen to so much from so many that we deplore the want of originality on the part of those who, in 1927, pose as advisers of industry. If only we could hear something new! Something new and practical at the same time!

The most helpful contribution, as we regard it, that has lately come under our notice is a speech delivered from the earth, not from the clouds, by Mr. Frank Hodges. Mr. Hodges doubts whether industrial relations can be improved by any formula, and asseverates that any plan that can be devised is useless unless it is based upon the will to good relations which must begin in the workshop itself. He declares that good relationships between Capital and Labour cannot be imposed from without—they must spring up from within. Of what use is it merely to preach goodwill? The better plan altogether is to employ practical means in the works themselves to introduce it or to give effect to it if already there.

Works committees have in quite a number of electrical and other factories done much to secure smoother working through the early consideration of grievances and suggestions and the introduction of various reasonable facilities and improvements.

Mr. R. R. Hyde, the Director of the Industrial Welfare Society, has lately quoted in the Press the outcome of an inquiry that he has made regarding the results attending the operation of such committees in many

trades. In respect of an electrical engineering works on the South Coast, he says: "there has been a greater tendency to settle minor disputes and grievances since the committee was organised"; and of similar works in the Lancashire area it is stated: "the committee has formed an invaluable medium between employers and management in settling the problems of working hours and short time during trade depression. Certain aspects of shop discipline have been greatly improved by the activities of this committee."

We are inclined to believe that, so far as the immediate outlook is concerned, all parties in industry are likely to obtain greater good from a large addition to the number of properly organised works committees than from any other single measure.

We have passed through a year of sore trial and have learned at what a gigantic cost we can engage in struggles to attain economic impossibilities. We have witnessed the great failure of the professional agitator, and now we need to get down together in each individual business, each of the parties interested therein contributing its own best efforts toward the re-establishment of stability and prosperity. It is certain that we cannot secure goodwill and contentment when the conduct of a business is unprofitable. When trade is low and losses take the place of profits, bankruptcy threatens and the menace of insecurity settles down upon worker and shareholder alike, the possibilities of improvement are at a minimum. Prosperity makes many things possible that without it cannot be introduced.

The Industrial Parliament that is again proposed for the twentieth time cannot provide a solution to our troubles unless it can find a way for our industries to be well occupied with profitable work. It may be the legitimate occupation of the politician and some others to engage in conferences, to draw up Bills, and to deliver speeches. Many of us have had our fill of this sort of thing, and we prefer to direct our effort primarily to securing additional trade for our manufacturers; nothing is more immediately essential for the well-being of the nation. All parties in industry ought to concentrate upon measures for securing new work. All kinds of schemes for finding ways out of the great unemployment problem of the British people must be examined and adopted; that is recognised. But while such ways are being developed throughout the Empire we must concentrate on reviving world trade and bringing business to our factories.

In his speech at the British Industries Fair luncheon last week the President of the Board of Trade referred to the perceptible growth in world trade as the world settled down, and he said that the advice to "Buy British Goods" had now become a national determination. We must sell British goods in every market that could be reached—there must be efficient salesmanship and advertising to that end, especially for trade development in our Empire markets. With "Peace, Progress and Trade" as our national policy at Home and abroad, we must increase our share of the expanding trade of the world while other countries were treading the path that we had already trodden back to financial stability.

As we desire to be above all practically minded in making these observations, let us look right at home in our own trade. The electrical industry—save perhaps the motor section which awaits the fuller revival of the various industries upon which it partly depends—is in a very active condition, and the prospect is excellent. This state of things should encourage electrical undertakings and traders to make further additions to their staffs, who shall at once get to work on ground that is waiting for attention and extract therefrom the new orders for goods and work that will produce more employment for electrical and allied manufacturers and contractors. If everybody in the industry and trade would see that his staff was adequate for the present opportunity, electrical men who are now waiting for a chance to make better use of their faculties might be absorbed.

High-Pressure Cables.

ONE effect of raising the pressure employed on underground cables from 11,000 to 33,000 volts has been to increase the frequency of breakdown to an altogether disproportionate extent, and it is clear that there is much to be learnt before the high standard of reliability attained at the lower pressures can be claimed for cables operating at 33,000 volts. At first the troubles were attributed largely to the joints, but experience has shown that faults occur in the cables themselves, for no obvious reason, and cable makers and users in all parts of the civilised world have been anxiously seeking the cause and the appropriate remedy. One theory, which appears to be well founded, is that however completely the interior of the lead sheath is filled with solid or liquid matter when the cable leaves the maker's hands, it is possible for spaces to be formed after the cable is laid, which are filled with gas of one kind or other; the gas being ionised by the electric field becomes a conductor, and permits electric discharges to take place, at first on a small scale, which eventually lead to the breakdown of the insulation. The fact that such failures frequently occur during times of light load suggests that when the cable is heated, the sheath is slightly stretched by the expansion of its contents, and lead being inelastic, it does not resume its original volume when the cable cools, so that spaces are left in the interior. We recall a somewhat similar trouble which arose in connection with 10,000-volt alternators, 15 to 20 years ago; the stator conductors were found to be attacked by nitric acid or other such corrosive agencies, which could only have been formed by electrostatic stress from the gases of the atmosphere. To prevent this class of mischief, the greatest care is taken to avoid the formation of air pockets and high potential gradients in the windings.

The importance of this subject, and the keen interest with which it is regarded by cable makers, are evidenced by the lively correspondence which has recently taken place in our pages, but even more significant are the reports that reach us and the disinterments of cables that may be seen in progress. British cables in the past have attained a world-wide reputation for reliability, and we have no doubt that our manufacturers will successfully solve the problems with which they and their competitors are faced.

One method which promises to attain the desired end was the main theme of the excellent and timely paper read by Captain P. Dunsheath, O.B.E., before the Institution of Electrical Engineers last week; another, which has been adopted by a number of British cable-makers, gave rise to the correspondence above mentioned. This is a matter for experts to decide, and we shall not presume to anticipate their ultimate verdict. But we may express satisfaction at the evident readiness of our manufacturers to undertake prolonged investigations and to adopt new methods when the need arises, and our confidence in their ability to deal with the present difficulties. Is not this the kind of problem which could be most efficiently tackled by co-operative research, such as is contemplated under the schemes of the Department of Scientific and Industrial Research? Presumably this aspect of the matter has not been overlooked by that admirable organisation, the Cable Makers' Association, which has done so much to enhance the status of our cable industry, and done it so well.

Sir George Sutton, in his speech at the recent extraordinary meeting of the Henley Company (ELEC. REV., December 24th, p. 1046), seemed to suggest some such pooling of research with other companies, with a view to eliminating wasteful expenditure.

Smoke Abatement.

THE Public Health (Smoke Abatement) Act, 1926, which is to come into force in July, 1927, whilst it still excludes the greatest sinners of all—the innumerable domestic chimneys—from the scope of its censure, greatly increases the penalties imposed on the emission of "smoke in such quantity as to be a nuisance" from other chimneys, and extends the

definition of smoke to include soot, ash, grit, and gritty particles. However, it accepts as a defence in proceedings for sending forth smoke other than black smoke (the unpardonable sin) from a chimney evidence that the person charged "has used the best practicable means for preventing the nuisance, having regard to the cost and to local conditions." The limiting colour, density, or content of smoke may be prescribed by by-laws made by any local authority, and it is to be hoped that the Minister of Health, in approving such by-laws, will take measures to secure something approximating to uniformity of treatment throughout the country.

An interesting section is one authorising urban authorities to make by-laws requiring the provision in new buildings of such methods of heating or cooking as are calculated to prevent or reduce the emission of smoke; but here again, unfortunately, private dwelling-houses are excepted. Local authorities are also put under the supervision of county councils, which may report them to the Minister of Health if they fail to carry out their duties with regard to smoke nuisances, and may be by him authorised to do the work at the expense of the defaulter.

It seems, therefore, that in future the laws against the emission of smoke will be enforced in many places where they have hitherto been allowed to lie dormant, and the owners of works in such areas had better take steps to make sure that they have a clean sheet—and clean chimneys—to show.

Further Artificial Silk Openings.

CONSTANT developments are taking place in the artificial silk industry in various parts of the world, and the opportunities for the electrical trade are considerable in view of the increasing use of the electric drive. The International Paper Co., of America, is now planning the erection of a mill for the preparation of artificial silk on its land near Ottawa, where it already has large pulp and paper mills.

In France, the Compagnie Française des Levure, Alcool et Drechure de Grains has formed a subsidiary company known as Soie Artificielle d'Amiens for the purpose of commencing the manufacture of the fibre, and as recently announced, the Rock Investment Co., of London, has let a contract for machinery to the value of £400,000 for a new factory at Branston, Burton-on-Trent. It is understood that extensive electrical power supplies and plant will be required in the latter case.

The development of the eucalyptus plant as a raw material for the preparation of wood-pulp both for paper and artificial silk manufacture, has resulted in the establishment in Brazil of a paper factory to be operated by the Paulista Railway Co. In this connection it is interesting to note that an effort is being made to persuade the Brazilian Congress to allow the importation of machinery duty free when required for the manufacture of national fibres.

The Electric Drive in Woodworkers' Shops.

A SERIES of visits to sawmills and pattern shops in the Midlands and North Country, recently, revealed the fact that in a very large proportion of them the electric drive has been adopted.

One of the great advantages of driving woodworking machines by electric motors is that their consumption of power varies almost in direct proportion to their loads: this is a very important consideration in pattern shops, because it is seldom that all the machines are in operation at the same time. In a sawmill, and in some carpenters' shops, the machines are run steadily throughout the day, but in pattern shops this is not so. The individual drive has obvious advantages when machines are used intermittently, one point in its favour being the fact that upkeep and maintenance costs for shafting and belting are reduced; small electric motors require little attention and cost but little to maintain: also, if additional machines are purchased and fitted with an individual electric drive, no difficulties are experienced with the existing countershafting and the output of the driving motor. In the case of the heavier saws and planers, there are obvious advantages in installing the electric drive and doing away with counter-shafting.

At one time it was considered the most economical policy to drive this class of machinery entirely by steam, because the burning of the wood shavings and cuttings enabled a certain amount of power to be generated for next to nothing: but with the installation of the electric drive, it was found that the wood refuse could be sold in a ready market, and that its value exceeded the cost of the electric power purchased from an outside source for operating the machinery employed. Hence, the woodworker, or sawmill owner, has obtained a reliable, steady, economical and safe drive by employing electric power, purchased from the public mains at a cost that may be covered by the sale of the refuse he was formerly in the habit of burning in inefficient and uneconomical steam-boiler plant.

There are, of course, other uses for electricity in the woodworking shop besides that of driving the machines. The electrically-heated glue pot, with facilities for regulation of the temperature, is a case in point. A very important recommendation of electricity in sawmills and other woodworking shops is the material reduction of the fire risk, for in such shops machinery has to be used in close proximity to heaps of shavings, and other inflammable material.

The Chairman of the Board.

THE announcement last Friday that the Minister of Transport had appointed Sir Andrew Duncan, M.A., LL.B., to be chairman of the Central Electricity Board put an end to the suspense in which the electrical industry has been hanging during the past month. It is in conformity with the statement of the Prime Minister a year ago, that the Board should be constituted of men of the highest business capacity, for although Sir Andrew has not figured prominently in the public eye, he has undoubtedly made his mark in the public service, as the record of his career which we print elsewhere will fully demonstrate. Though comparatively a young man, he has acquired much experience in national affairs during recent years, and has given evidence of fairness, tact, and breadth of vision, allied with energetic action and organising ability, which should admirably fit him for the very responsible and onerous post that he has accepted; we wish him all success in his new sphere of work.

It remains for the Minister, with the help of the chairman, to select the remaining members of the Board, whose names, it is anticipated, will be announced before the reassembly of Parliament next month. The various interests specified in the Act have been consulted by the Minister, but some of them appear to have taken a narrow view of the matter, making a selection from their own membership instead of casting the net over the whole country and seeking the best men for the job, irrespective of all other considerations. The Electricity Commissioners are charged with the technical work—the Board with administration; it should really resemble a first-class board of directors.

The "Agreed Clause."

EVERY speaker at last week's dinner of the Electrical Contractors' Association made reference to the "agreed clause" inserted in the Electricity (Supply) Act, to govern the sale of appliances, &c., by municipal electricity supply authorities. While the general tone was optimistic, in one or two passages a certain anxiety could be sensed. Of course, the scheme is not yet actually working, and it will need the continuance of the good feelings engendered by the Conferences under Mr. D. N. Dunlop to make it a success. Nevertheless, we think that, generally, success will be attained, for both parties realise that continued dissension will be harmful both to themselves, and to the industry as a whole.

Generating Station Costs.

Logarithmically ruled paper has certain advantages over ordinary squared paper, but hyperbolic ruling is more generally useful in engineering work. It suits costing problems particularly well, as is shown below.

By REGINALD O. KAPP, B.Sc., A.M.I.E.E.

LOGARITHMIC paper is well known, though not very extensively used. There are two principal types of problem for which its use has advantages over that of ordinary squared paper: Firstly, it enables curves to be plotted over a wider range of values with equal percentage accuracy at all parts of the curve; secondly, certain functions which give curved lines on ordinary squared paper give straight lines on logarithmic paper. For instance, a rectangular hyperbola of the type $yx = a$ constant gives a straight line at 45 deg. if plotted on paper in which the scale divisions are logarithmic both in the horizontal and vertical direction. Equations of a type to give straight lines on logarithmic paper are very rare in engineering work, and that may be a reason for the restricted use of such paper.

Many problems in engineering work involve calculations on the lines of a two-part tariff for electricity. This tariff may, therefore, be taken as an example. One wants to find out the cost per kWh of electricity where that cost is made up of a kilowatt charge and a unit charge. To arrive at the total cost, one divides the kilowatt charge by the number of kWh per kilowatt and adds the unit charge to the result. Written in a formula, the calculation becomes:

Cost per unit = kilowatt charge/8,760 × L.F. + unit charge.

The equation is, therefore, of the form—

$$y = b/x + a.$$

This equation gives, if plotted on ordinary squared paper, a rectangular hyperbola, of which the origin is not on the x axis. Plotted on logarithmic paper, it does not give a straight line, and therefore logarithmic paper is of little use for plotting such an equation.

If plotted on hyperbolic paper, a straight line is obtained.

The convenience of being able to employ a straight line for any plotting operation is considerable. It is only necessary to determine two points in order to rule the line. Intersections with other lines are definite, and the operation of drawing with a ruler is much simpler and more accurate than drawing a curve. In fact, the time spent in determining a sufficient number of points to draw a curve through them, the inevitable inaccuracy of the curve when drawn, and the lack of clarity, particularly at the steep parts, is sufficient to make the use of squared paper hardly worth while. This is unfortunate, since curves give more information than "spot" readings obtainable from pure arithmetic. If an engineer can plot his results on a curve, he sees not only the general tendency of the occurrences he is interested in, but also obtains a better idea of the relative importance of various factors. There is nothing like plotting results to help one's sense of proportion. Moreover, one may make a mistake in arithmetic and not notice it very readily. A curve is more likely to show up any errors.

Problems of maxima and minima can, of course, be solved by algebra or differential calculus. They can often be solved more readily by the simple process of plotting a couple of curves and finding where these intersect. In this case the advantage of the plotting method, apart from the fact that it is easier and more convincing, is that it shows up clearly whether a departure from the mathematical minimum matters much or not. It may often happen that one pedantically designs for the mathematical minimum in cases where there is hardly any difference between the minimum point and points quite a long way on each side. For instance, one can calculate the amount of condensing water required to give the minimum running cost, taking account of turbine steam consumption and energy expended in pumping. The calculation does not show readily that the cost is almost the same, even if one employs a good deal more or a good deal less condensing water. I think that much time and argument would be saved and better engineering practice employed if co-ordinate paper were more fully used. Some works put up placards in their shops with slogans intended to improve the minds of their staff. A slogan that I have never seen, but which would be more useful than many adopted, would be: "Use more squared paper." This excellent advice would be more readily followed if the plotting of curves were easier; but ordinary squared paper does not always meet the bill and functionally divided paper is of greater practical value.

Since so many cases are of the hyperbolic type mentioned above, a useful scale in which to divide the paper is a hyperbolic one, since this enables all

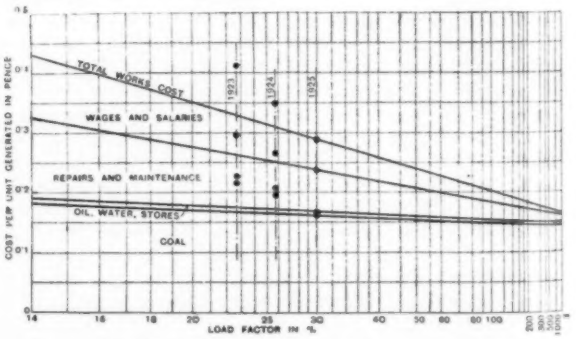


Fig. 1.—Graphical Representation of Works Cost per Unit Generated.

equations of the above form to be plotted as straight lines. The costing of electricity is not the only case where this equation forms the basis of one's work. It is the basis of all costing operations. For instance, take the case of a motor-car; it costs so much per year to *keep* a car, and it costs, in addition, so much a mile (for petrol and the like) to *run* a car. It costs so much per year to be in a position to manufacture screws (capital charges on the machines, and so on), and it costs, in addition, so much for materials per screw. The total cost per mile run in the case of the car, or per screw manufactured, is obtained by dividing the annual charge by the number of miles or number of screws per year, and adding the unit charge. All costing problems of this type can be plotted as straight lines on hyperbolically-divided paper. As an example, let us consider the case of generating costs of electricity.

Figure 1 shows the generating costs as imagined for

a station in the year 1925. The actual load factor for that year was 30 per cent., and the lines show what each item would have amounted to at any other load factor. They enable, therefore, a direct comparison to be made with the results obtained in previous years, and "spot" readings for these are plotted for the years 1923 and 1924, showing a steady improvement in total works cost. The graph shows clearly how much of the improvement is due to improvement in load factor and how much is due to improved working conditions. There is a reduction in coal per unit and in wages and

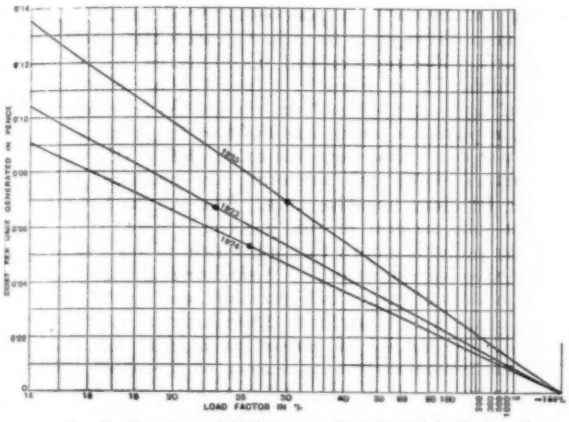


Fig. 2.—Repairs and Maintenance Costs Per Unit Generated.

salaries independently of the reduction due to improved load factor every year.

Repairs and maintenance lines for the three years are plotted separately on fig. 2, and these show that, whereas there was an improvement in 1924, the 1925 figures are not so good. If, instead of plotting the curves, "spot" readings were taken, it would appear that the 1925 results were almost equal to those of 1923. When allowance has been made for improvement in load factor, it is seen, however, that they are distinctly worse, and the lines on fig. 2 show this immediately. Clearly the repairs and maintenance items need investigation. Here is a case, therefore, where the station engineer can, by plotting curves, see clearly what his station is doing in all respects. He can see clearly where his results are gratifying and where there is room for improvement.

Other costing problems arise when a decision has to be made between alternatives. Suppose, for instance,

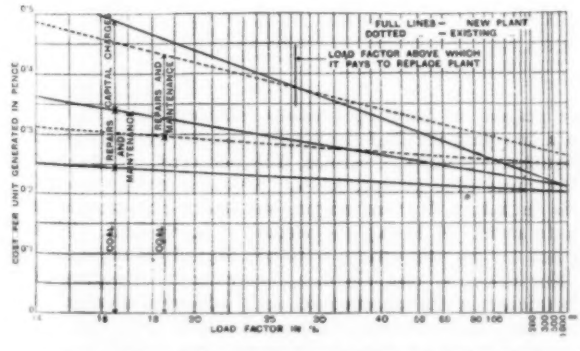

FULL LINES — NEW PLANT
DOTTED — EXISTING
LOAD FACTOR ABOVE WHICH IT PAYS TO REPLACE PLANT
REPAIRS, CAPITAL CHARGES AND MAINTENANCE
REPAIRS AND MAINTENANCE
COAL
OIL
COST PER UNIT GENERATED IN PENCE
LOAD FACTOR IN %

Fig. 3.—Relative Costs Per Unit with Existing and New Plant.

a station engineer wants to find out whether it is worth while retaining an old somewhat inefficient set, or whether it would pay to replace it by new efficient plant. If he buys new plant he has to incur the capital expenditure on it, and in exchange he will reduce his running costs. Such an example is worked out on fig. 3. Let us assume the load factor is 30 per cent. and that the coal costs at this load factor amount to 0.28 pence, and that repairs and maintenance cost 0.09 pence per unit. The engineer finds that this cost is subdivided for coal into 79.3 pence per kW maximum demand + 0.249 pence per unit generated, and for repairs and maintenance 195 pence per kW maximum demand + 0.0155 pence per unit generated.

New plant could reduce these costs to 63.6 pence per kW maximum demand + 0.2 pence per unit generated for coal and 126 pence per kW maximum demand + 0.01 pence per unit generated for repairs and maintenance. Suppose the new plant would cost £10 per kilowatt of maximum demand and the capital charges are 9 per cent., this amounts to an additional kilowatt charge on the new plant of 216 pence per kW maximum demand. We will assume that the other items of works cost are identical in both cases and need, therefore, not be introduced into the calculation. If the plant is to be worked at a high load factor, the saving in works costs of the new plant will be great compared with the extra cost per kWh due to capital charges on the new plant, whereas if it is to be worked at a low load factor the bill for coal and repairs and maintenance will be small in any case and will not matter much. There must, therefore, be a point above which the saving in coal, repairs, and maintenance predominates over the extra cost per kWh, due to the capital expenditure on new plant. Where this point is can be found without great difficulty by arithmetic, but it is much easier to obtain it graphically as is done in fig. 3, where it will be seen that it is at a load factor of 27.5 per cent. If, therefore, the plant is to be worked above this load factor, it is worth replacing it. If below this load

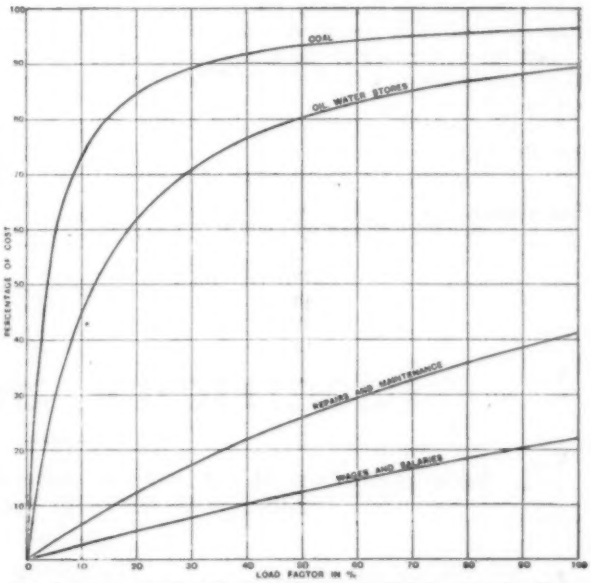


Fig. 4.—Percentage Cost Per Unit Generated which is a Running Cost.

factor, it is better to retain the old plant. It will be seen, however, that the lines do not intersect at a very sharp angle, and that therefore there is not much in it between load factors of, say, 20 per cent. and 40 per cent., so that probably in a case like this the engineer would decide to wait a while before making a change.

Though, as mentioned above, the same result can be obtained by arithmetic, or can be expressed in the form of a table to the engineer's satisfaction, he may often find that he has not finished his job when he has satisfied himself on the point in question. There may be a committee or a board of directors to convince, and many engineers have found out that a non-technical body of men has little faith in figures and little ability to understand them or patience to try to do so. It is often much easier to convince non-experts of a technical matter, in itself sound, if one can show them a graphical representation. Even if they do not understand the graphical representation, they may think they do, which for all practical purposes is just as good. A graph impresses itself on one's memory more definitely than mere figures can do.

It is convenient to have a ready rule to determine

what the slope of the lines corresponding to each item should be. This depends, of course, on the particular conditions of the station, since the proportion of fixed to running charges must vary somewhat in each station. It is not quite easy to analyse station costs in such a form as to be very certain what the proportion should be: it is admittedly largely a matter of opinion, but I think that fair average figures are as follows:—

For coal, kW cost = 318 × unit cost.

For oil, water, and stores, kW cost = 1,080 × unit cost.

For repairs and maintenance, kW cost = 12,600 × unit cost.

For wages and salaries, kW cost = 31,100 × unit cost.

In this form the figures convey little to the mind. They can be expressed in other ways. For instance, at 30 per cent. load factor the running cost part of the total cost of each item is as follows:—

Coal, 89.2 per cent. of the total cost for coal.

Oil, water, and stores, 70.8 per cent. of the total cost for oil, water, and stores.

Repairs and maintenance, 17.3 per cent. of the total cost for repairs and maintenance.

Wages and salaries, 7.8 per cent. of the total cost for wages and salaries.

Given the works costs for each of these items at a load factor L, the following formulæ give the part of each item, which is the running cost component:—

Call the percentage of the total cost per unit, which is a running cost, n and the load factor L, then for coal—

$$n/100 = 87.6\ L/(318 + 87.6\ L);$$

for oil, water, and stores—

$$n/100 = 87.6\ L/(1{,}080 + 87.6\ L);$$

for repairs and maintenance—

$$n/100 = 87.6\ L/(12{,}600 + 87.6\ L);$$

for wages and salaries—

$$n/100 = 87.6\ L/(31{,}100 + 87.6\ L).$$

From these formulæ the unit charge for each item can be obtained, or it can be read off the curves on fig. 4. If an infinite number of kWh are sold, the only cost per kWh is the unit charge. This is the figure that, when using hyperbolic paper as in figs. 1 to 3, must be plotted on the scale at infinity and a straight line through the point thus obtained, and the working point at the working load factor gives the cost at any load factor.

In the case of items having a steep line, an even simpler construction is possible. The line for each item passes through a certain characteristic point on the x axis. For repairs and maintenance this is the point which will be given by minus 144 per cent. load factor if fig. 4 is applicable to the station in question, that is, a point as far to the right of the infinity line as 144 per cent. load factor is to the left. Of course, load factors above 100 per cent. are practically impossible, let alone negative ones. The graph, however, does not take account of this practical absurdity. On fig. 2 the point is shown through which all repairs and maintenance lines must pass. A similar point for wages and salaries is at minus 355 per cent. load factor. For capital charges and anything containing no unit price at all, the point is, of course, at infinity l.f., that is, at the bottom right-hand corner of the sheet. The point for coal is at minus 3.63 per cent., and for oil, water, and stores minus 12.35 per cent. l.f. These points are, however, inconveniently far away.

With regard to the use of hyperbolic paper, it should be noted that the figures on the horizontal scale can be multiplied by any figure, and the scale still remains hyperbolic, so that, for instance, the left-hand edge of the scales used in figs. 1 to 3 (starting at 10) could be made 1 per cent. or 20 per cent. the 1,000 per cent., or 50 per cent. mark then respectively becoming 100 per cent.

Electricity Supply Tariffs.

Some particulars of the various deferred-payment agreements and electric light and power tariffs in force at Basle, Switzerland.

By Professor W. CRAMP.

IN the course of his article upon Tariffs for Electricity Supply in the ELECTRICAL REVIEW of October 22nd (pp. 659-660), Lieut.-Col. Vignoles plumps for two-part tariffs, and in his concluding paragraph uses these remarkable words:—"It is to be hoped that engineers will consider this question of tariffs as settled." By a "two-part tariff" Lieut.-Col. Vignoles means a tariff consisting of a first charge, based directly, or indirectly, on the consumer's maximum demand, and a second small running charge per kWh.

On the other hand, in the President's address to the I.E.E., we read that 90 per cent. of the houses in Switzerland are electrified as against 18 per cent. in Britain, and we know that the load factor in Basle was 56 per cent. in 1915 and 74 per cent. in 1924. We know further that in the same city no less than 8,200 kW of water heaters are installed, largely for domestic purposes, and many of them in quite small houses. Have these results been obtained under a two-part tariff? I think not; nor do I believe that like results can be obtained in this country by "considering the question of tariffs as settled." For the two-part tariff fails in one most important respect. It does not give the consumer enough encouragement to take his energy during the periods of very light load. In Manchester I was on a two-part tariff of the kind approved by Lieut.-Col. Vignoles. I paid, I believe, 12½ per cent. of my rateable value plus ½d. per kWh. This led me to use electric radiators day and night, but it did not encourage me to switch off during the periods of heavy load. That is not the way to achieve a 74 per cent. load factor.

For the chief obstacle to a cheap domestic supply of electricity is the absence of such adequate storage as the gas undertakings possess in their gas holders, whereby any load factor, however poor, may be increased to unity at the generators. In Switzerland, the importance of this principle has been more fully recognised, and arrangements have been made to combine the supply of apparatus with such tariffs as shall encourage the virtual storage of energy by the consumer. In effect, this amounts to the substitution of a large number of small local holders for a small number of large central holders. It may be that these developments in Switzerland are due to the fact that the power comes chiefly from waterfalls; for the cost per kWh in a hydro-electric station is dependent very largely upon capital charges, so that a high load factor is of the greatest importance. On the other hand, in this

country the perpetual increase in the size of the steam generating station and its power units, coupled with the greater radii of distribution, tends also to increase that part of the cost per kelvin which is due to capital charges, relatively to the part which is due to fuel.

Thus the conditions in this country constantly tend to approach those in Switzerland, and we should do well to compare the Swiss results with our own, that we may benefit by their successes while avoiding their mistakes.

My assistant, Mr. L. G. A. Sims, who was recently in Switzerland, has brought back for me the various regulations and tariffs published by the Electrizitätswerk, of Basle. These seem to be so important that I have translated and analysed them. They may be divided into: A, those regulations which govern the supply of apparatus; and B, those which govern the supply of energy. In all cases I have interpreted the prices at the exchange rate of 25 francs to £1, which is roughly correct to-day.

In group A we have deferred-payment agreements provided for various purposes, but in all cases the payment is extended over a period of six years from the installation of the apparatus. Also in all cases the work is carried out by firms holding special concessions from the supply authority for that purpose, the supply authority exercising a control over the apparatus and the manner of installation.

Although the period for the complete payment does not vary, the period for the instalments varies considerably, some being half-yearly, some quarterly, some monthly, and so on. This must complicate the accounts of the supply authority, as well as those of the purchaser, and the amount of bookkeeping involved must be very great. It is difficult to see any reason in or for this variation.

A (1) Coming now to examples of these agreements, we have first the regulations to "facilitate the installation of electric lighting in small dwellings," which seem to refer chiefly to flats (Etagenwohnungen). Here the installation includes the supply and installation from and including the main switch to the lamp holder, but not the lamps. A maximum of ten lamps per dwelling is allowed on the deferred system, although extensions of this number may be arranged privately by the tenant. However small the first installation may be, once it is completed, no extension whatever is permitted on deferred payment; and the first installation must include those points where light is most used, *e.g.*, living room and kitchen. The standard installation includes:—

(*a*) For the parlour or dining room, one simple rise and fall pendant, with an ordinary lamp holder and porcelain shade.

(*b*) For the remaining rooms, a plain pendant with a porcelain shade, or a simple ceiling fitting.

For each lamp a switch is provided, but all making good of paint, brickwork, &c., is at the charge of the tenant. No reduction is made if the tenant provides his own fittings.

The payment for each point installed is 55 cts. (5.3d.) per month. The cost of an installation, therefore, is about 5s. 4d. per year per point for six years. This would be regarded in England as exceedingly dear, since it is quite possible to wire a small house in this simple fashion for 15s. per point.

A (2) Next we may take the regulations "to facilitate the installation of small boilers (and to reduce unemployment in electric factories)." Here the installation consists of the supply and erection of the boiler, switches and fuses, also wiring up to a length of 10 metres (33 ft.). Anything beyond this length must be paid for in cash, and the connection of the boiler to the water supply is not included. Two sizes of boiler are offered, and the extended payments are quarterly. The details are:—For a boiler of 30 litres (6.6 gallons) capacity and 360 watts loading, 12 fr. (9s. 8d.) per quarter; for a boiler of 50 litres (11 gallons) capacity and 600 watts loading, 16 fr. (12s. 10d.) per quarter.

These prices amount to £1 18s. 8d. and £2 11s. 4d. per annum for six years, and are relatively much cheaper than the lighting installation, doubtless because boilers have been developed to a greater extent in Switzerland. It is also of interest to note, in conformity with what has been said above, that long-hour heating of the water is taken for granted. It is evidently anticipated that advantage will be taken of the terms offered for energy supplied during off-peak hours (see B8 below), and thereby the equivalent of heat storage of energy is introduced. For a simple calculation shows that to raise the temperature of the water in either of these boilers by 70 deg. C. will require at least seven hours. The list price of the smaller boiler in this country is £16. 16s., and of the larger size £20, which compare unfavourably with Swiss prices.

A (3) A third example of this deferred-payment policy is found in the regulations to facilitate the installation of automatically controlled electric lighting in the staircases common to two or more flats or other dwellings. In this case again the installation is complete up to, but not including, the lamp. The owner is responsible for the proper use and maintenance of the installation, as well as for any painting and making good of the building after installation. Simple ceiling fittings are provided, but if better fittings are desired, they must be supplied by the owner, and no reduction is made on that account. The conditions apply to a new installation in an existing building, or to the exchange of an old non-automatic system for one with automatic control, but they do not apply to new buildings. The actual hours during which the automatic switch turns on the light are in the agreement for the supply of energy (see B11 below), clearly indicating that the two are supposed to be related. The charges for the installation are as follows:—Two points, three switches and 22 metres (73 ft.) of wiring, 9.5 fr. (7s. 7d.) per six months; for each further point with one switch and 7 metres (23 ft.) of wiring, 2.5 fr. (2s.) per six months.

Thus for the first two lamps the charge is about 15s. per annum for six years. Considering that this includes special switches, it is quite reasonable; for the cost of the switch alone in this country would be about £12.

B (1) We turn now to the electric light and power supply prices. The ordinary flat rate for electric light is 55 cts. (5.3d.) per kelvin.

B (2) There is, however, a double tariff for installations controlled by time-switches, as follows:—

Peak-load hours, *i.e.*, 6.30 to 10 p.m. in summer, and 6.30 to 9 a.m. and 4.30 to 10 p.m. in winter, 55 cts. (5.3d.); all other hours, 20 cts. (1.92d.).

B (3) For power purposes the following tariff holds:—

Kelvins per month.	Price per kelvin. Centimes.	Pence.
Up to 1,000	22	2·1
1,001 to 2,000	18	1·72
2,001 to 3,000	14	1.34
above 3,000	10	0·96

A discount is allowed from these prices which introduces the maximum demand. It is calculated as follows:—

Discount per cent. = (kelvins per annum) ÷ 150 times the maximum demand for the year in kW. The nearest whole number to this figure is taken, and no discount is allowed below 5 per cent. or over 40 per cent. Also the value of the monthly consumption must not fall below 7 fr. (5.6s.) per kW of maximum demand, or the latter minimum is charged. The calculation of the maximum demand for large power users is obtained from an m.d. meter, which gives the mean of the maxima over any quarter of an hour in the year. As a method of calculating the monthly payments, the m.d of the previous year is taken until December, when the adjustment is made for the whole year. In the case of a new load, the m.d. is reckoned as 70 per cent. of the installed kW. It is usual to grant more favourable terms than these to electrochemical and other industries with a specially high load factor. Nothing whatever is said as to power factor.

(To be concluded.)

Extra-High-Pressure Transmission.

With the adoption of extra-high-pressure distribution to outlying districts, continuity of service may be sacrificed to some extent for the sake of economy in first cost. This article emphasises the importance of guarding against that error.

By A. T. SCOTT, A.M.I.E.E.

AT the present time transmission lines and cables are being rapidly extended by electricity undertakings to their outlying districts in order to increase the load on the generating stations, and to cover the authorised supply areas. The immediate gain in revenue from such extensions is often small in comparison with the expenditure, and is not helped by the fact that the price per unit is cut as low as possible in order to obtain increased business; consequently the initial cost of extensions tends to become a leading consideration, and it is to be feared that under these circumstances the continuity of the supply given, and the service rendered, is not always comparable with that formerly given from the l.p. networks supplied direct by local generating stations.

It might appear unnecessary to draw attention to the fundamental importance of maintaining a good supply and a truly continuous service, but there is a real danger of too frequent breakdowns being explained away, and of a certain number of interruptions being accepted as a necessary evil common to e.h.p. transmission systems of any considerable magnitude. This is especially so when such interruptions are not confined to one particular area. A 90 per cent. supply has been advocated as being better than none, but on the other hand, continuity of service is essential in order that electricity may be universally adopted, not merely as a stand-by, but as an indispensable source of energy. If an electricity supply can be absolutely relied upon, the demand for it will increase and its usefulness reach a maximum value.

That an electric supply can be cheapened more effectively by increasing the demand and load factor than by any other means has often been pointed out, and there can be no doubt that good service will eventually contribute more towards this increase than the initial cheapening of a supply at the expense of reliability. An e.h.p. supply is vastly more important than any individual l.p. supply, and generally the importance may be considered as proportional to the transmission voltage. Very satisfactory and reliable supplies have been and are being given at pressures up to 20,000 V in many places.

More recently 33.000 V has been adopted for long-distance transmission, and for large modern generating stations this is now the usual bus-bar voltage, yet it is very doubtful if the use of this pressure has contributed towards any improvement in the reliability of the supply up to the present. It is not the highest pressure that has been used in this country, but it is the highest contemplated by many undertakings, and it is considered the most suitable for main transmission and for interconnecting within the bounds of the areas outlined by the Electricity Commissioners. In certain cases where it is being used, the results are not as good as had been anticipated, and in other cases the results have been altogether unsatisfactory.

During the past few years it would appear that there has been a tendency for certain undertakings to be unduly ambitious in their endeavours to cover their authorised areas with transmission lines or cables, and that they have been guided far more by political than commercial or economic considerations. Where such influences as over-ambition and politics have predominated it is quite possible that a higher voltage than necessary has been chosen and put into use before sufficient experience has been gained, before any really complete scheme has been formulated, and before sufficient capital has been available to enable adequate provision to be made for the effective operation of the extended system.

Under such circumstances it is more than likely that only the bare necessities for a supply have been provided, that switchgear and protective gear have been reduced to an ill-considered minimum, and that very possibly the factors of safety of overhead lines and cables have been reduced below the safe value. Static sub-stations may have been left unattended and overhead lines unpatrolled, and an organisation for speedily attending to breakdowns may have been conspicuous by its absence.

The present uncertainty with regard to the future national developments is no doubt responsible for certain important centres being left dependent upon one source of supply only, whereas with a proper scheme of interconnections, a duplicate and alternative supply could be provided. It should not be inferred that continuity cannot be realised with e.h.p. transmission without providing elaborate and expensive apparatus, neither is there any reason to suppose that 33,000 V is particularly difficult to deal with. It is, however, desirable to bear in mind that as the voltage of transmission is increased so the minimum economic load is increased, and also that if interconnections are desirable for the maintenance of continuity on l.p. networks, they are much more so where e.h.p. supplies are concerned.

Attention might also be drawn to the practice of laying cables made for a comparatively high voltage and using them at a lower one until the demand justifies their use on the pressure for which they were designed. This practice creates a premature demand for high-pressure cables, and the experience which might be gained by their normal operation is deferred; so that, as cable design and manufacture are rapidly improving, the cables are liable to become of an obsolete type before they are used on their designed pressure.

Having now emphasised the importance of continuity of supply and considered certain conditions which possibly hinder improvement, the following brief suggestions will probably suffice to indicate where advancement might be made.

A definite improvement can be effected by the provision of a greater margin of safety throughout the insulation of the line, by the adoption of a more liberal design of insulator which will definitely ensure that an adequate factor of safety over the worst conditions under which the insulators may operate. Certain rules are laid down in reference to tests etc., but such rules are likely to be very misleading. Operating

conditions vary very considerably in different parts of the country, and an insulator may operate very well in one locality while proving very unsatisfactory in another. Herein lies the danger of the adoption of general rules. The design of insulator should be studied in connection with each line, and the ideal solution will be found as a result of close co-operation between the designer of the line and a reputable firm of insulator makers with the advantage of experience behind it.

The provision of more liberal clearances between the lines, and if necessary the use of suspension insulators in place of the pin type, may also prove to be advantageous. Faults due to external causes will also be diminished in number by the same means, and further improvement will be realised by a strict and periodic patrol of the lines, by the provision of a liberal right of way cleared of trees, and by duplicate lines to any given point being run along separate routes. When the factor of safety of the insulators is low, efficient means of cleaning these will be desirable. Duplicate supplies are essential for loads above 1,000 kW, and effective discriminating protective gear, working in conjunction with reliable automatic switches, is necessary in order that a faulty feeder or line may be disconnected while the supply is still maintained through the other line. When substations are unattended, automatic self-acting switches are desirable in order that a line or feeder may be switched back into service after a fault has been cleared.

Important centres of distribution or load centres are served to the best advantage when supplied from more than one generating centre, and therefore interconnection becomes a necessity. When several generating centres feed a common load area, unity of supervision and control is essential. Long-distance transmission lines require sectionalising at suitable intervals, and organised repair gangs located at strategic points connected by telephone are desirable. In times of war and civil disorders underground supplies are freer from disturbances than overhead lines, and they are also less liable to be damaged by, or constitute a menace to, aircraft; and where a large number of circuits have to emanate from a given centre, overhead lines may be impracticable on account of the space required for their accommodation. For these and other obvious reasons it is worth while to consider whether eventually all main or national electrical supplies shall be laid underground or overhead, and in this connection the practice of the G.P.O. with regard to trunk telephone lines may be significant.

Legal.

British Thomson-Houston Co., Ltd., v. West Yorkshire Electric Co., Ltd.

ON an *ex parte* motion, Mr. Justice Tomlin, in the Chancery Division on January 21st, granted an injunction over a week to the British Thomson-Houston Co., Ltd., restraining the West Yorkshire Electric Co., Ltd., of Leeds, and its manager from parting with certain incandescent electric lamps which the plaintiff company alleged infringed its patents.

Mr. BASIL DREWE, for the plaintiff company, said he moved *ex parte* because they found that persons in possession of infringing lamps very often got rid of them as soon as the writ was served on them.

Theft of a Vacuum Cleaner.

AT Darlington Police Court, on January 20th, Robert Evans, a labourer, was fined £3 for the theft, as bailee, of a vacuum cleaner, valued at £20, the property of Mr. William Sykes, electrical engineer, Darlington. The evidence showed that the accused was engaged by the prosecutor to sell goods on commission, on the representation that he was accustomed to demonstrating and selling vacuum cleaners. He was given a cleaner for demonstration purposes only, but becoming dissatisfied with accused's conduct, prosecutor demanded the return of the cleaner, and then found that it had been sold. Accused had had other articles from Mr. Sykes to sell on commission, and they had been sold, but the money had not been handed over. In all £45 worth of goods had been sold by accused in that way. Evans's defence was that he bought the goods and that he was to pay for them at the end of the month and receive 2½ per cent. trade commission.

General Engineering Development Trust, Ltd.

MR. JUSTICE ROMER, in the Companies' Winding Up Court, on January 18th, had before him the petition of Walter Hill and Co., Ltd., for an order for the compulsory liquidation of the General Engineering Development Trust, Ltd., which was formed to exploit an invention relating to an electrical route indicator called "The Pathfinder."

Mr. SWORDS, for the petitioners, who are judgment creditors, said suggestions for a scheme of arrangement and an offer to pay had been made, but the petitioners were not satisfied with them.

Mr. WALLINGTON, for the company, said that a good deal of money had been put into the invention, and it was now getting on to its feet. The company was short of capital, and an arrangement had been made to provide a further £10,000. The majority of the shareholders were in favour of the scheme.

His Lordship adjourned the petition for 14 days.

Correspondence.

Maximum Potential Gradients.

Perhaps I may be allowed a few lines in your esteemed journal to reply to the question raised by Mr. Dunsheath in the discussion on his paper this week.

I do not wish it to be taken that I am at all putting forward the maximum potential gradient in any "blindfold" way, as the figure obtained by a stereotyped formula; I am contending for the importance of knowing *what is* the maximum potential gradient, and *at what part* of the cable it takes place.

May I give the following quotations:—

Messrs. Roper & Halperin (paper before the Amer. Inst. Electrical Engineers, May, 1926):—

"The brown or black spots generally appear in the middle or outer portion of the conductor insulation, sometimes accompanied by tiny punctures *in the layers near the conductor*. . . .

"The evidences of ionisation are generally found in the largest quantity *where the stresses are the greatest*. . . ."

The next paper I would refer to is that by Mr. Farmer, read before the Am.Inst.E.E. in May, 1926, in which, after attempting to get the relation between life and stress based upon average values of the gradient, he finds he gets a much more consistent result by introducing the *maximum* gradient.

The third reference which I shall give is from the paper by Mr. Hoover, presented to the Amer.Inst.E.E. in June, 1926, in which he endeavours to show that the volt-ampere characteristic of the insulation, which has its critical point at about 3 milli-amperes per sq. cm., is the determining factor of the maximum gradient itself, and he arrives at the rather interesting result expressed by the following quotation from his paper:—

"It is seen that the maximum gradient is at some point near *the centre* of the wall of insulation, and is *not* at the surface of the conductor as is ordinarily assumed. In fact, the gradient at the conductor is less than that at any other point in the insulation."

My present position in the matter is that an engineer must be guided by various practical considerations in assessing the position of the maximum potential gradient.

Such things, for example, as the non-uniformity of the arrangement of the layers of the paper, the poorness of impregnation towards the centre of the cable (except in the case of Pirelli) and the temperature gradient through the insulation under load have all, it seems to me, quite an important bearing, apart from the latest qualifications introduced by Mr. Hoover.

Other things being equal, the current density through the insulation would be a function of the potential gradient at that point, for uniform permittivity and resistivity.

A. M. Taylor,
Major, S.O.2.

Birmingham, *January 22nd*, 1927.

The Electric Market Place of the Future.

I was very interested in Mr. Berry's article in your issue of January 7th.

I think the idea of holding demonstrations of and lectures on domestic electricity in cities and towns is excellent, but I do not think it would be of much use in villages, even where there already is power, as villagers proper would not be likely to install electrical apparatus in farm or cottage even if they could afford to do so, and the large houses probably

have all the latest appliances. I think this method is far better than house-to-house canvassing, which often annoys people, but after the public demonstrations it would most likely be possible to arrange to give some at private houses to likely purchasers. A great deal might be done by qualified demonstrators and lecturers; the lectures should be of the popular type, and be given by women—in fact, "the use of electricity by women for women" might be a good heading for placards and advertisements.

At present I am sure the majority of women are scared of electricity and absolutely ignorant even of fundamentals. I quote two instances from personal experience. A friend asked me if it was a sign that her iron was hot *when it made a noise!* Her little girl used to say: "Mummie, the iron's talking!" and she thought it was then hot enough to use!! The solution was probably a loose connection. Another woman always took her iron about with her and put it on to the lighting circuit of any hotel at which she was staying, blissfully ignorant of such a detail as difference in voltage! These instances are, I think, representative of the average woman's attitude towards electrical apparatus, and this must be overcome if power is to be used to any extent in ordinary homes.

One point I think important is that women should be taught simple maintenance repairs, just as the woman driver can do ordinary running repairs to her car. Probably the local contractor would disapprove of such knowledge being general, as he would lose a great many jobs which can be very profitable under the vague wording "time and material," the latter usually meaning a piece of fuse wire! It is not enough to demonstrate a vacuum cleaner or cooking stove and leave the woman without the slightest idea of what to do if minor faults develop; particularly does this apply to replacing blown fuses. With a cooking stove a fuse *might* blow just before the arrival of guests for dinner, and the local contractor *might* have gone home; the result is awful to contemplate! Nor should such practical knowledge be left to the man of the house; domestic appliances are in the women's department, and she ought to have the necessary knowledge to keep things running. One thing that is very much against the greater use of electrical apparatus in the home is the extraordinary conservatism of servants, and this is a very real difficulty that the mistress is up against; they have a fear and distrust of "new-fangled" notions—whether this applied equally to the pioneer days of gas perhaps some reader older than I may remember.

Gladys F. Moreland.

Shinfield, Berks., *January 22nd*, 1927.

I should like to express my appreciation of the article by Mr. H. H. Berry in your issue of January 7th, and particularly to emphasise the desirability of all supply undertakings which are contemplating holding an electrical exhibition getting in touch as soon as possible with the Exhibition Committee through the director of the Electrical Development Association.

The value of a special electrical exhibition for a week or a fortnight cannot be too highly appreciated, and my own experience, which will no doubt be supplemented by many other supply engineers, is that the money is well spent whatever the cost may be.

Mr. Berry's vision of an electric market-place in every city is that of the idealist, but without an ideal to aim at we shall not make progress, and I am certain that many will agree with me that of all propaganda that which gives the best return is actual demonstrations and exhibitions where all interested may see actual apparatus, examine it, test it, and criticise it.

Mr. Berry is throwing himself heart and soul into this particular aspect of electrical development, and it is to be hoped that all will contribute their full measure of support, suggestions, and assistance in order to ensure its fullest practical use for the purpose in mind.

As Mr. Berry says, Wembley on a miniature scale in every town and village in the country should be our ultimate aim.

Fredk. W. Purse,
Engineer and Manager,
West Ham Electricity Dept.

Stratford, *January 17th*, 1927.

The Signs of Trade Revival.

Some friend of mine—I do not know him personally, but anyone who believes in better times is a friend—writes an interesting article in your issue dated January 14th, 1927. No more suitable time than the opening weeks in the New Year could be selected for making resolutions, even though they be doomed to failure.

Among a few, the cry of "Trade Revival" has become a catch-word, and if the Electricity (Supply) Act has supplied politicians with a want, it does not prove that industry can assimilate the suggested improved conditions; admitted that everything is new in the world, and that no one knows who is bankrupt, and who is solvent, the scheme cannot do what is suggested. On the other hand, it offers serious objections and features that have been disparaged and denounced, and, like all the other fashionable huge combinations in and out of operation, causes grave and serious discontent, especially among the middle class, which has not the "ear of the Press" or the public. That class bears all the burdens of changing life silently, and with no offer of co-operation; the outlook is not encouraging, for all these amalgamations provide a channel for scrapping loyal servants, usually of middle age.

Platform speakers urge the necessity of preserving individual liberty and freedom, and immediately agree to conditions that destroy the possibility.

The cotton industry, it is said, offers great hopes! If I read correctly, the reason is that orders for new machinery have been placed, but where is the machinery going to? Read in the *Manchester Guardian* of the world's competition, and probably you will assume that our foreign rivals have reaped another advantage. Read, also, of the efforts of various professors, and well-known economists, to salvage the industry, and discern any improvement, if possible. With cotton at about 2s. 6d. a lb., a boom was prophesied when it dropped to 1s., but to-day, at less than 7d., the state of prosperity is as far off as ever; consequently, many cotton shares stand at a discount. Textile people do not buy on a falling market, and it is just possible that the foreign customer will not buy for stock until he thinks the market has touched "bottom"—raw cotton has; but can he think the same of the existing high taxes, rates, and other items? The fact of working a few hours a week, or "short time" as it is called, instead of being fully occupied, is sufficient proof that prices have not touched "bottom."

It is pleasing to read of the "record" prosperity of the electrical trade. Statistics indicate full time work in all branches of production, with the exception of the *industrial* motor section; just so. Again, an increase of 24 per cent. due to orders for super-stations at home is reported, but as this type of order savours of "taking in one another's washing," perhaps we can only be thankful that Bumbledom did not send these orders abroad.

The world we live in is a new one, and history teaches us nothing. Commerce is new, and, unfortunately, there is a tendency to employ soulless methods, where loyalty and service are not of recognised value. Many unpleasant facts are not brought into light and frankly discussed, prosperity requires more confidence and co-partnership under the new conditions. For years past, a few gentlemen in high estate have seen a "silver lining in the sky" and preached optimism, but their arguments were not based on facts, so perhaps you will believe that the trial and anxiety of waiting for something to turn up has forced many thoughtful people to expect new remedies, and view with suspicion any prophecy.

L. E. Wilson.

Manchester, *January 17th*, 1927.

Electric Ovens.

Our attention has been drawn to a letter in your journal by "Oven," referring to the above subject.

We have had nearly four years' practical experience of baking, both bread and confectionery, in electric ovens, and can assure you this experience proves that the statement made—that the products taste of ozone—is entirely erroneous.

A "Magnet" oven which we obtained from the General Electric Co., Ltd., is in daily use at one of our depôts, and with this type of oven it is impossible for the food to come into direct contact, as the heating wires are entirely enclosed. One might just as well claim that a steam-pipe oven, when fired by coal, coke, or oil, creates a taste in the products according to the fuel used.

Assuming that ozone was created, every baker knows that, in the case of bread, for at least the first half-hour steam is being given off by the dough, and therefore it cannot absorb anything during that period, after which the crust would equally prevent any contamination.

In conclusion, it may be of interest to many of my friends in the trade to know that since we have had these ovens in use not a single one of the heating wires has melted.

Trusting the foregoing explanation may help to dispel any doubt on the point raised.

W. Parker-Butler,
Manager,
F. CARRINGTON.

London, *January 18th*, 1927.

We are particularly interested in the letter signed by your correspondent "Oven" in your issue of January 14th, and wish to offer our opinions based upon fairly wide experience. As Switzerland is mentioned, we may say that our parent house, situated in Aarau, has installed large numbers of electric ovens in bakeries in Switzerland, and obtains better baking results than with steampipe ovens, which type is known to be fired alternatively with coke, oil, gas, &c.

Our sister house in Pantin, Seine, has similar experience: also our Milan house. So much for Continental users.

Our experience in this country and the United States, combined with intimate knowledge of Continental practice as above mentioned, prompts us to state that there is no foundation for the statement of the gas journals unless they have located some isolated oven or ovens of bad design and with unique characteristics.

We do not place the elements in the baking chamber, but locate them in tunnels directly below the oven deck and above the oven crown. In common with most designers, we grade the resistors to dissipate their full rated energy at normal temperatures without reaching red heat. Can you imagine

such a design generating ozone to spoil the bloom, flavour, colour, or odour of the baked loaf?

Being impartial on the question of types fired by coal, coke, wood, coal gas, natural gas, and oil, and ignoring working cost in view of the unreasonably high charges per kWh prevalent in most parts of this country, we can assure "Oven" that the goods baked in a well-designed electric oven are superior in every respect to goods baked by any of the other types enumerated, and far from being damaged, they are many points ahead under all tests known to bakery experts: volume, bloom, flavour, colour, odour, and keeping qualities. As usual, the gas journals live up to the scare-monger reputation.

We conclude with the following facts given to the undersigned in June last when at Berne with President Ad. Ingold and Secretary Hans Haldemann, of l'Association Suisse des Patrons Boulangers et Patissiers (Association of Swiss Master Bakers and Confectioners). This Association has 145 local Associations, comprising 5,300 Swiss bakers out of a total of approximately 6,000 throughout Switzerland, and they are antagonistic towards the prohibition of night baking, which is now law. Although this edict is in force, they have a strong case against it. The Associations have estimated that with the 6,000 ovens in Switzerland, and assuming that 4,000 will be electrified within the next fifteen years, they will save 120,000 tons of imported coal per annum, and will use 320 million kilowatt-hours of electricity, which is available from their natural resources through the hydro-electric power stations. This conversion will only be possible so long as they are able to use the ovens during the night hours, when special low rates are charged. At present in Zürich alone, 30 per cent. of the ovens are electric.

Does this indicate that electric bake ovens damage the goods? Would they talk of wide conversions of ovens to electric heating if the finished articles were inferior?

Gas journals please copy.

Artofex Engineering Works, Ltd.
W. ELLERD-STYLES, M.I.E.E.,
Managing Director.

London, *January 20th*, 1927.

River Water—or Cooling Towers?

I feel sure that many of your readers, in common with myself, have read the article in your issue of the 14th inst. on "River Water or Cooling Towers," by Mr. J. N. Waite, M.I.E.E., with considerable surprise.

Mr. Waite sets out to prove that instead of there being a difference of 10 per cent. in thermal efficiency as between a station using river water and one using cooling towers, only half that gain can be obtained in practice. Mr. Waite's basis of comparison, namely, 29.1 in. for river-water conditions and 28.2 in. for cooling-tower stations, is cutting the difference very fine, and I doubt whether he could substantiate that difference by a series of comparative calculations. This, however, does not account for the main difference, nor does the fact that he neglects to make any allowance for the additional power required to raise the circulating water to cooling-tower level, which in practice generally amounts to the equivalent of practically 1 per cent. of the steam consumption of the unit. His main argument is based on the statement that modern steam turbines are not able efficiently to utilise the difference in energy available at the lower terminal pressures. The half-load figures published in fig. 1 prove that practically the whole of the theoretical gain can be obtained, given a correctly designed low-pressure end.

I believe that every turbine maker, not only in this country but all over the world, is prepared to guarantee his ability to build turbines of the largest sizes required which will utilise the heat energy efficiently down to 0.9 in. Hg, and even below that. Are we to assume that all these engineers are mistaken, and that they are staking huge sums of money rashly on opinions which they cannot substantiate, practically every day of the week?

There is no need to question the accuracy of the methods employed by Mr. Waite in carrying out the tests which have led him to his conclusions, but the figures he shows seem hardly sufficiently conclusive to justify such a sweeping condemnation of a world-wide industry, that incidentally has the honour of including the greatest living inventor of our generation.

R. J. Kaula.

Erdington, *January 19th*, 1927.

Power Supply to Wireless Receivers.

With all due respect to the position which Mr. Turner holds, I do not think that some of the statements he has recently made regarding wireless receivers should be allowed to go unchallenged.

I think that the human ear, provided it be competent, must be the final judge as to whether a broadcast receiver is distortionless or not, and after several years' experience with receivers of all types, including Burndept I am now using instruments which, to my mind, give absolutely distortionless reproduction of both speech and music, although they break all the laws recently laid down by Mr. Turner.

In the first place, the low-frequency amplifier in these receivers employs THREE transformers, two intervalve and one output, which should, according to Mr. Turner, absolutely ruin the quality of reproduction. Also the h.t. consumption at 120 volts maximum is as follows:—2-valve receiver (1 power valve) 3 mA; 3-valve receiver (1 power valve) 5 mA; 4-valve receiver (1 power valve) 8 mA, as against Mr. Turner's figures of 13 to 20 mA, below which he states it is impossible to obtain good reproduction.

I do not wish to name the receivers, as I do not think the Correspondence Column is the place for any kind of advertising, but I should imagine that Messrs. Burndept have a great respect for the makers of the receivers that I have in mind, as they are using a cone type loud-speaker manufactured by this firm in conjunction with their own Ethophone receivers, and I should be glad if Mr. Turner would confirm my measurements if he has an opportunity.

I should state that my opinion as to the excellent quality of the reproduction of these receivers is supported by many other users, most of them far more competent to judge than I am, and whose names are well known in the musical world.

With all due respect to resistance capacity coupling for the good reproduction of music, I have yet to hear really good speech reproduced by this method, and it seems to me that the whole question is a matter of correct receiver design.

To avoid any risk of being accused of attempting to advertise a rival receiver, I enclose my card, but prefer to sign myself

Interested.

January 14th, 1927.

The "H" Type of Cable.

I have read with some regret, not amusement, the many letters which have been published in the last two issues of your journal. Quite apart from the relative merits of either the belted or the "H" type of cable, Mr. Nisbett is quite right in intimating that there is no reason for booming the "H"-type cable as though it is the only satisfactory one which is being made by British manufacturers; obviously this attitude is very depreciatory towards our colleagues. Mr. Nisbett is to be congratulated for his stand in this direction, as there are undoubtedly as good brains in this as any other country, and it was noticeable that at least one C.M.A. cable designed to eliminate tangential stresses was not received with the same joy as the "H" type.

There is no reason why the "H"-type cable should not be made by our cable firms, but we can surely overcome the difficulties in three-core cables in our own manner, and one way to this end would be to eliminate destructive criticism and obtain our amusement at the expense of others quite apart from business.

No one is entirely blameless, but let us try to expend our energies in the right direction.

E. B. Nixon, A.M.I.E.E.

Newcastle-on-Tyne, *January 15th*, 1927.

New Uses for Electricity in Switzerland.

Our correspondent at Vevey, Switzerland, says that the year 1927 opens with yet further demonstrations of the wide use to which electric power can be put in Switzerland. There are two new undertakings, both of which have to do with quarries, but for very different purposes. In the Ajoie, a new society, "Electrolyse" by name, has taken over the quarries at Cornol, rich in gypsum, from which it hopes to extract sulphuric acid and sulphate of aluminium. To this end the "Electrolyse" has acquired an old foundry in the district, and transformed the whole thing into an electrical works with all the latest appliances likely to speed up the purposes for which the quarries have been bought. Thanks to this up-to-date plant, the "Electrolyse" has already made progress; the yield from the gypsum is most satisfactory, and the residuum after the sulphuric acid and the sulphate of aluminium have been extracted can be used as a fertiliser, and on account of its low price is fairly certain to obtain a ready market.

The second undertaking is in the canton of the Tessin, near Mendrisio. The marble quarries of Arzo, near by, have been celebrated for centuries in Switzerland and North Italy for their reddish-tinted marble, beautifully veined and spotted, and visitors to the Milan Cathedral never fail to admire the Baptistery Chapel, which is decorated with this particular marble. Thanks to the far-sightedness of the present director of the quarries, the output, which had been languishing a little, has more than recovered its former activity. Mr. Rossi has taken the initiative, and under his superintendence all the plant of the Arzo quarries has been electrified. One of the specialities of these quarries is a thin slab of marble used for facing purposes; the new electrically-driven saws give much satisfaction, as the thickness desired can be more evenly obtained than by means of the old hand saws, or even machine saws, and the marble facings can be kept at the desired size. In order to encourage the development of the new enterprise at Arzo, the Swiss Government has ordered this marble to be employed for the decoration of the lobby and office of the new post office at Bellinzona, now in course of construction, and the electrical installation at Arzo is at present working at high pressure.

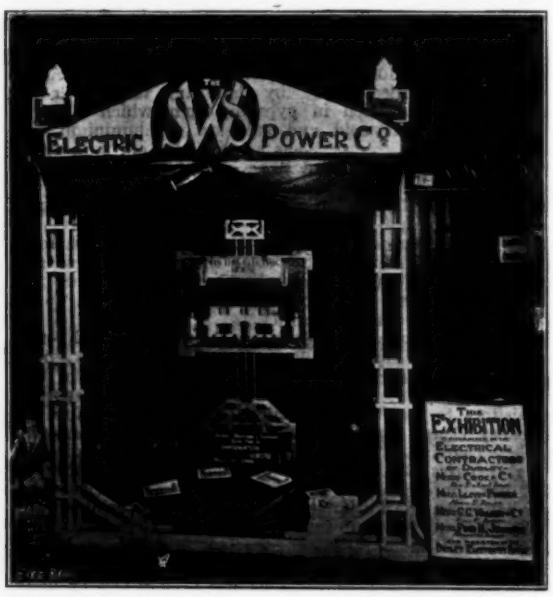
Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Campaign Notes, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The E.D.A.-E.L.M.A. Campaign.

The official report of the Campaign for the week ended January 22nd states that new circles were formed during the week at Peterborough (chairman, Mr. H. Sanders) and Beckenham (Mr. J. Tapper). Demonstration electric houses were opened at Muirend (Glasgow), Hull, and Leicester. The attendance at the Denton (Manchester) demonstration house is reported to be satisfactory. The Hull demonstration house is being opened officially by the Lady Mayoress. In connection with the Sheffield house, which was to be opened on January 24th, 1,000 bills have been posted in the city tramcars. Coloured lighting has been freely used in the Muirend house, which was opened by Lady Paxton; between 750 and 1,000 people are visiting the house daily. "Electroville," one of the latest Newcastle houses at Bishop Auckland, is attracting an average of 1,000 visitors per day. It is expected that a demonstration house will be opened at Carlisle next week. The Manchester circle has decided to run four more houses at Rusholme and Chorlton-cum-Hardy (Manchester), Prestwich (Salford), and Stretford. The demonstration house at Beckenham has resulted in a considerably increased demand for cookers in the district; another, larger, house is in contemplation. Tamworth is preparing to open a house early in February. Over 5,000 people visited the Walsall house during the first fourteen days of its run. As reported below, the Hampstead Circle opened an exhibition at the borough electricity works on January 22nd. The North-East Coast Area Committee is organising a special children's competition in connection with the campaign. Prizes are being awarded for the best models of the prize house—the materials to cost not more than two shillings; for the best "slogan"; and for the best reproduction of the front cover of the competition booklet.

We have already made several references to the big part which is being played in its area by the Shropshire, Worcestershire, and Staffordshire Electric Power Co., to further the objects of the campaign. We now illustrate another phase



A Campaign Display at Dudley.

of the company's activities—a special campaign display at an electrical exhibition at Dudley organised by the company in conjunction with Messrs. Cook & Co., Lloyd & Ferrer, G. G. Walker & Co., and F. H. Jennings, all Dudley electrical contractors.

An exhibition organised by the Wolverhampton Circle was to be opened by the Mayor of Wolverhampton yesterday (Thursday). Mr. W. N. Gordon, A.C.I.S., is the hon. secretary of the circle.

Last week at the London Lighting Service Bureau, the organisers of the campaign had on view a model of the prize house prior to its being sent to the Provinces. The model is on a fairly large scale and is provided with a vertically-hinged front which opens outward and closes again continuously, actuated by a small motor and gearing concealed in the base. The little rooms are handsomely furnished and equipped with tiny "electrical" appliances. While the cooker seen in the kitchen does not cook, all the lamps light and provide ample illumination to enable the interior to be inspected. The model is available to local circles, which are required to pay a small fee for its use. Its first public appearance will be made in a shop window in one of the main streets of Liverpool.

Since being opened on January 17th, the all-electric house at Muirend, Glasgow, has been visited by large numbers of people. Lady Paxton, who performed the opening ceremony, is a vice-president of the Electrical Association for Women. The equipment is of the most up-to-date character. The pantry-kitchen has a "High-Low" cooker installed in it. The vacuum shown is a "Little Glutton." Among the heating apparatus of different types in the various rooms are a "Magicoal" fire and an "Inventum" heater. Downstairs the lighting fittings are by Messrs. Osler & Faraday, and upstairs by the General Electric Co., Ltd.

The Americans are watching the progress of the Campaign with interest, and will not be slow in taking advantage of the benefits which will accrue from it. *Commerce Reports*, after commenting on the campaign and indicating the share of the United States in the British domestic electrical appliance business, says:—"These figures indicate that electrical household appliances of American manufacture meet with a favourable reception in the United Kingdom, and that if our manufacturers take full cognizance of the co-operative marketing campaign now under way, they should have an excellent opportunity still further to increase their sales for this particular class of apparatus." There seems to be room for a "Buy British Electrical Goods" slogan.

Russian Orders for Germany.

The head of the Russian Trust for Mass Production, M. Ots, who recently returned to Leningrad from the Ruhr, has sent an order to the Deutsche Maschinen Fabrik A.G., Duisburg, for the delivery of the equipment for a metal works. The German firm has accepted the required guarantee that the factory equipped by it will deliver annually two million poods of rolled metal and only twenty workmen will be necessary to look after the machines. The Siemens-Schuckert concern has received the order for the electrical equipment of the factory. Other German firms have received orders for the equipment of other factories under the Trust to the value of half a million roubles. —*Reuter* (Duisburg).

The B.E.A. and Railway Rates.

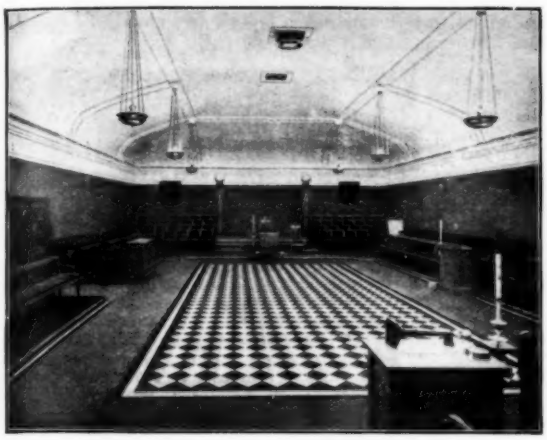
The following resolution was passed last week by a special committee of the British Engineers' Association:—"The British Engineers' Association deplores the policy of the railway companies in proposing to increase the burden of railway rates to be borne by industry and trade in their present state of depression, and at a time when they are struggling to recover from the serious effects of their recent dislocation. The engineering industry, like most other producers, is working on very small margins with the object of recovering trade, and in these circumstances it is thought to be most unfair that railway rates should be increased without at least three months' notice being given to enable the manufacturer to avoid or minimise this new encroachment on his margins in respect of existing contracts. The daily experiences of manufacturers and traders in this country make it abundantly clear that considerable railway economies could be effected, and it is strongly felt that the possibilities of such economies should be thoroughly investigated before a further handicap is placed on industry and trade by any such increase of railway rates as is now threatened."

The Radio Manufacturers' Association.

This Association has addressed to the wireless trade a request for particulars of any matters which the recipients consider to militate against the maintenance and improvement of the sale of British radio apparatus. Replies are required before February 1st, and upon the receipt of these the matters raised will be analysed and collated. The Association points out that the greater the backing which is received "the greater the prospect of a successful issue to any case presented by the Association—in whatever quarter—on behalf of the industry."

A "Mazda" Lighting Installation.

The accompanying picture has been reproduced from a photograph taken solely by the light provided by the lighting installation. The view shows the interior of the Masonic Temple, Douglas, I.O.M. The installation consists of eight "B.T.-H." "Eye-Rest" fittings, each furnished with a 500-W "Mazda" gasfilled lamp. The fittings give an excellent daylight effect



The Masonic Temple, Douglas, I.O.M.

and the lamps being hidden from normal view no glare is caused. The illumination is obtained by means of secondary reflection from the ceiling and upper parts of the walls. The installation was carried out by Messrs. V. A. Bellamy, electrical contractors, Douglas, to the specification of the architect, Mr. W. H. Lomas, Douglas.

Employment During December.

The *Ministry of Labour Gazette* states that employment in the engineering industry during December last was bad, but showed a general improvement as compared with the previous month. The industry was still handicapped by a shortage of raw materials. There was a marked improvement in electrical engineering; the percentage of unemployed fell from 6.8 in November to 6.1 in December. The "overall" figures for the engineering industry were 16.7 per cent. in November, and 14.3 in December. The improvement extended to other branches of electrical industry. In the electrical wiring and contracting section unemployment decreased from 8.7 to 8.2 per cent., and in electrical cable, wire and lamp manufacturing there was a fall from 7.9 to 7.1 per cent.

Unemployment.

There was a decrease of 63,840 in the number of registered unemployed during the week ended January 10th. The total at that date was 1,432,000, as compared with 1,221,400 on January 11th, 1926.

Radio Business in Poland.

The British Commercial Secretary at Warsaw has forwarded statistics from the local Press which show that the number of broadcast receiving licences issued in Poland increased from 4,977 in 1925 to 34,556 in 1926. On the other hand, the number of dealers declined from 269 to 239, indicating that Poland has also experienced the usual process common to the initiation of a wireless industry, in that numbers of small firms which went into the business, lacking both experience and capital, have not been able to withstand even favourable conditions.—*Board of Trade Journal.*

Radio Royalties in Australia.

It is reported from Melbourne that Amalgamated Wireless, Ltd., has claimed the exclusive Australian patent rights for the principal articles used in the construction of radio receiving sets. The company has notified manufacturers that it requires them to pay royalties of 12s. 6d. and 17s. 6d. per valve in respect of each set sold. The report also states that the company is endeavouring to make this claim retrospective, and this has caused some concern among the smaller traders. The Commonwealth Government holds a large interest in the company, but is reported to have declared that it does not intend to take any action.

The Hampstead Electrical Exhibition.

We incorrectly stated in our last issue that the Hampstead Electrical Exhibition, which opened on Saturday last and closes to-morrow, was organised by the General Electric Co., Ltd. The Hampstead Circle under the E.D.A.-E.L.M.A. Campaign is the responsible body, and while the G.E.C. has a stand at the show, other leading companies are also playing an important part. The British Thomson-Houston Co. has a display which includes electric lighting fittings and other domestic electrical appliances, electric fans, and industrial motors suitable for driving sewing machines, washing machines, and other appliances. There is also exhibited a quantity of radio apparatus, including the "R.K." loud speaker, which faithfully reproduces both speech and music. "Tungar" battery chargers, in sizes suitable for home use and for the battery-charging station or garage, are also shown. A special demonstration exhibit of the various stages of manufacture of "Mazda" lamps provides a very instructive feature. The Siemens & English Electric Lamp Co., Ltd., also has a good display of domestic and other appliances, including irons, kettles, vacuum cleaners, many types of electric fires, table cookers and cooking ranges of the "Siemens-Xcel" pattern. The exhibition, which is being held at the Electricity Department's premises, Lithos Road, was opened by the Mayor of Hampstead, who was accompanied by the Mayoress; he was received by the chairman of the Circle, Ald. Geere Howard, Mr. Leadbeater (borough electrical engineer), and Mr. M. Watson (hon. secretary and treasurer of the circle). An excellent handbook has been prepared in connection with the exhibition, containing details of the exhibits. In addition to those mentioned above, the following companies are showing appliances of various kinds:—Messrs. Falk, Stadelmann & Co., Ltd.; the Metropolitan-Vickers Electrical Co., Ltd.; the Edison Swan Electric Co., Ltd.; the Sun Electrical Co., Ltd.; the Hotpoint Electric Appliance Co., Ltd.; the Cable Accessories Co., Ltd.; the Jackson Electric Stove Co., Ltd.; Berry's Electric, Ltd.; the British Electric Transformer Co., Ltd.; Standard Telephones & Cables, Ltd.; and Burndept Wireless, Ltd. The circle has a special display which includes "Arora," "Belling" and "Heatrae" fires, the "Tellus" vacuum cleaner, "Helios" adjustable fittings, "Selz" shades, "Frigidaire" refrigerators, "Ever Ready" novelties, &c.

A French Company's Centenary.

The works at Mulhouse and Belfort, Alsace, of the Société Alsacienne de Constructions Mécaniques were recently *en fete*, the occasion being the 100th anniversary of the establishment of the undertaking. Commenced in a small way in 1826, the concern is now one of the largest in France, and in recent years has considerably extended its electrical engineering department, which has turned out the bulk of the plant for the large power station at Gennevilliers.

Philips Lamps at the "Astoria" Kinema.

In the "Astoria," a palatial kinema in Charing Cross Road, W.C.2, which was opened on January 12th, Philips electric lamps have been extensively used. No fewer than 3,000 of these lamps have been installed in the outside signs, which are shown in the accompanying illustration, and 840 have been used in the interior lighting, in addition to flood-lighting

The "Astoria" Kinema.

lamps and special Philips projector lamps used with the kinematographic apparatus. The outside signs are made up of 650 daylight lamps and 1,900 red, blue and yellow colour-sprayed and clear lamps. For the interior lighting special diffusing fittings have been installed which provide soft and restful, but adequate, lighting.

Local Exhibition.

The Electricity Committee of the Stepney Borough Council has recommended that an electrical exhibition be held at the Queen's Hall and Winter Garden, Stepney, between April 25th and May 13th next.

D

A New Cable Company.

According to a report in the *Western Mail*, a new company is in process of formation with a capital of £100,000 to manufacture electric cables. Sir Edward Nicholl, who is described as the head of the concern, has purchased an aircraft works at Addlestone, in Surrey, for £17,250. Sir Herbert Blain is one of the directors. It is stated that the existing machinery in the factory is to be disposed of, but that the new plant for cable manufacturing is already available for installation.

An Illuminated Tramcar.

The illustration herewith shows an illuminated tramcar provided by the Bristol Tramway and Carriage Co., for collecting purposes in connection with the Lord Mayor of Bristol's Christmas Dinner Fund. This car was equipped with over 1,000 "Siemens" helical traction lamps, and its journeys

An Illuminated Tramcar at Bristol.

created considerable interest, and were responsible for the collection of a large sum of money. The Automobile Accessories (Bristol), Ltd., operated their public speech equipment on this car, thereby providing amusing nightly programmes.

British Electrical Equipment in Canada.

In connection with cabled dispatches from London, quoting the criticisms of the British Press concerning the requirements of the Fire Underwriters' Association that all electrical installations and equipment in Canada, as well as in the United States, must conform with the National Electrical Code and be sanctioned by the Chicago Testing Laboratories, which apparently discriminate against British-made equipment, it is stated here that the new Canadian electrical code will probably be completed within a few months. A committee of the Engineering Standards Association, at the instance of the Trade and Commerce Department, has been working on the intricate problem for several years, and on January 20th the first draft was completed; it conforms largely with the American National Code, which is also undergoing revision. The final revision of the Canadian code is expected to be ready for submission to the meeting of representatives of fire underwriters, provincial authorities, and others interested, at Winnipeg, a few weeks hence. This code will provide for Canadian autonomy in respect of both fire and safety "hazards" of all electrical installations in Canada, though it will be necessary subsequently to establish adequate testing laboratories to obviate the present necessity of the Chicago tests. At present, the standards prescribed by the Ontario Hydro-Electric Power Commission are accepted by the underwriters for that province, and in some measure also by the other provinces, though there is not yet uniformity for the whole Dominion. It is declared in Canada that, in respect of Canadian importation of British electrical equipment, there is no evidence to show that any important contracts have been lost through failure to secure the sanction of the Chicago authorities, since compliance with the Ontario regulations is practically acceptable to underwriters of the other provinces. It is known, however, that British manufacturers have practically no chance of securing the United States market because of the refusal of the Chicago laboratories to approve their products.—*Reuter* (Ottawa).

The Electrical Contractors' Conference at Scarborough.

We have received at the moment of going to press a copy of the preliminary programme of the Second Annual Conference of the Electrical Contractors' Association Allied Associations, which takes place on June 22nd, 23rd and 24th next. We shall refer to the matter more fully next week.

South African Contract Regulations.

The *Board of Trade Journal*, dated January 20th, contains extracts from the Tender Board Regulations for the Union of South Africa (Railways and Harbours excluded), and from the Rules for the Purchase of Government Supplies. These appear to offer no special preference to British manufacturers, but South African manufacturers and merchants receive first consideration in the awarding of contracts, other things being equal. The document referred to can be inspected by interested British firms at the Department of Overseas Trade, 35, Old Queen Street, S.W.1.

British Companies Undercuote Continental Competitors.

The Johannesburg correspondent of *The Times* says that gratification is expressed in local business circles that the British tenders for the erection of the new Johannesburg municipal gasworks are lower than the foreign offers. Of the eight tenders, only five are complete offers to build the plant and structure, and these complete tenders range from £153,160 to £266,968. The firms who have tendered are Bruce Peebles and Co., Ltd., Edinburgh; Drake's, Ltd., Halifax; Woodall-Duckham Vertical Retort and Oven Construction Co. (1920), Ltd., London; West's Gas Improvement Co., Manchester; Julius Pintsch, Ltd., Germany; Francke Werke A.G., Germany; Aug. Klonne, Germany; and the Skoda Works, Ltd., Prague. The tenders will probably be submitted to a consulting engineer.

A Manchester Power Efficiency Exhibition.

TEXTILE AND INDUSTRIAL EXHIBITIONS, LTD., 121, Deansgate, Manchester, is organising a Power Efficiency Exhibition to be held at the City Hall, Manchester, from June 22nd to July 2nd. The exhibition will include machinery, apparatus, and precision instruments designed to secure power economies, and it is claimed to be the first of its type.

New French Telephone Company.

It is reported from Paris that the Société de Téléphone Grammont has been formed by the Etablissements Grammont with the participation of the General Electric Co., Ltd., and an American company. The share capital is 18,000,000 fr., and the object is to carry out the orders given to the parent French company in connection with the conversion of the Paris network to automatic working.

The Irish Radio Import Duty.

Mr. J. J. Walsh, the Postmaster-General of the Irish Free State, said in a recent speech that it was impossible to abandon the import duty upon radio apparatus. The Government intended to spend a large amount upon the development of broadcasting, including the erection of a station at Cork in the near future and a high-power station later, and it relied upon the duty as well as licence fees to meet the expenditure. There was no justification for making those who were not listeners pay for the amusement of those who were.

Mullard Window Displays.

The MULLARD WIRELESS SERVICE CO., LTD., has arranged three different window displays for the use of retailers of its radio valves. One of these is illustrated herewith; it

A Mullard Window Display.

makes a feature of "Radio for the Million," a publication which the company has brought out. Retailers who wish to avail themselves of these displays are asked to give particulars of the size of their windows and the dates upon which the displays are required. If necessary, a professional window dresser is sent to arrange the window.

Another Birmingham Exhibitor.

The lists of exhibitors at this year's British Industries Fair which appeared in our issue of January 14th, contained the names of firms whose products were directly of interest to our readers. There are many others who are connected with the electrical industry by parts of their business. Such are Messrs. H. H. Vivian & Co., Ltd., who intend to show at Birmingham, *inter alia*, condenser tubes, busbar and strip copper, &c.

The Ideal Home Exhibition.

This year's Ideal Home Exhibition is to be held at Olympia, W., from March 1st to 28th. The General Electric Co., Ltd., informs us that it intends to make a special display of "Magnet" domestic appliances.

Rumoured Continental Electrical Agreement.

Rumours continue to be circulated concerning a scheme for the formation of a working community between German, French, and Belgian electrical concerns, in the matter of international contracts. Discussions between the firms in the last two countries are said to have already led to the drawing up of "guiding lines" for joint action. On the other hand, the A.E.G. and the Siemens group do not appear to have been definitely approached in the matter.

Calendars and Diaries.

We have received from Messrs. SINCLAIR, PAGET & Co., LTD., New Inn Yard, Shoreditch, E.C.2, a wall calendar with boldly-figured monthly sheets.

What is, we suppose, one of the last but by no means the least of the pocket diaries for 1927 to reach us from electrical firms is that received from Messrs. J. H. TUCKER & Co., LTD., of King's Road, Tyseley, Birmingham. It is an excellent case, with receptacles for all kinds of things, and the diary and note-book portion is particularly useful to business men.

We have received from Messrs. W. G. BEAUMONT & SON, of Priory Works, Bow, E.3, a copy of their large year book and desk diary for 1927—bound in cloth, and illustrating some of the chimneys, steel buildings, bridges, &c., which they have painted or repaired.

Trade Announcements.

MESSRS. NEWTON BROTHERS (DERBY), LTD., state that owing to the rapid expansion of their manufacturing department it has become desirable for them to be allied with certain large manufacturing interests of a kindred nature, and the scope of their activities will be considerably increased. Although they have found it necessary to form themselves into a public company to meet the new conditions, the control and management of the business remain the same. The contracting and retail department of the business conducted from the St. James's Street premises has been taken over by Mr. C. A. Newton, who is carrying on the business under the style of C. A. Newton & Co. All outstanding contracts which are in course of execution by that department will be taken over by C. A. Newton & Co., and will be carried out by the same staff, with Mr. G. F. Nuttall as manager. Mr. C. A. Newton retains his seat upon the board of the limited company.

THE DEVON ELECTRIC LAMP CO. has opened new showrooms at 29, King Street, Tavistock, and will be pleased to receive catalogues and factors' quotations for all electrical fittings, lamps, and accessories.

MESSRS. SINCLAIR, PAGET & Co., LTD., New Inn Yard, Shoreditch, E.C.2, have recently enlarged their works and have commenced making battery-charging switchboards.

THE AUTOCAR ELECTRICAL EQUIPMENT Co. has taken over an additional building at 115, Old Street, E.C.1, and its Mitchell Street premises are being retained solely as a workshop. Telephone numbers: Clerkenwell 5470 and 7318.

MESSRS. GREENWOOD & Co. have opened electrical showrooms at Prince's Crescent, Bare, Morecambe.

MESSRS. ALEXANDER & Co., 266, Windmill Road, Ealing, W.5, have been appointed sole British agents for the radio and electrical products of Messrs. H. Constable & Co., Paris.

It is announced that, in order to cope with the demand for its radio specialities, the FELLOWS MAGNETO Co., LTD., of Park Royal, N.W., is giving up the manufacture of magnetos.

New showroom premises at 4, Northampton Street, Dover, have been opened by Mr. C. O. CLARK, electrical engineer and contractor, of the East Kent Radio and Electricity Works, Mill Road, Deal.

MESSRS. G. E. WALLIS & SONS, LTD., electrical engineers, of 30a, High Street, Ashford, Kent, have taken over the electrical department of Messrs. C. Hayward & Son, of 18, New Street, Ashford. Messrs. Hayward will continue their radio department.

MESSRS. WELLS & Co., of 23-27, High Street, Bedford, have taken over the electrical staff of Messrs. Kilpin & Billson, of High Street, Bedford. They are equipping showrooms and workshops for this department of the business.

The CENTRAL RADIO STORES on January 22nd opened premises at 51, London Road, Bromley, Kent.

MR. C. H. H. KENWORTHY has opened an electrical engineering business at Bank Street, Herne Bay.

New Catalogues and Lists.

MESSRS. JAMES MCMILLAN & Co., Clun House, Surrey Street, W.C.2.—A pamphlet describing a portable telephone instrument for line testing made by the A.S. Elektrisk Bureau, Oslo.

THE RADIO COMMUNICATION Co., LTD., 34-35, Norfolk Street, Strand, W.C.2.—List No. X.1,226, illustrating and describing the company's radio direction finder equipment.

THE TELEGRAPH CONDENSER Co., LTD., Norwich House, Southampton Street, W.C.1.—Catalogue No. 51, describing "T.C.C." static condensers for power-factor correction. Examples of actual installations are depicted.

MR. ALAN WRIGHT, 124, Chancery Lane, W.C.2.—A pictorial pamphlet explaining the construction and operation of Film cooling towers, which are made by the company of that name.

MESSRS. STEWART, THOMSON & PATRICK, LTD., 10 & 12, Hart Street, Liverpool.—A stock list of d.c. and a.c. motors, ranging from 1 to 130 h.p., &c.

THE STONEBRIDGE ELECTRICAL Co., LTD., Victoria Road, North Acton, W.3.—Leaflet No. 95/1, containing an illustration of and notes upon one of the company's universal precision instruments for various kinds of tests.

THE BEKO LAMP Co., LTD., 5, Finsbury Square, E.C.2.—A price list of "Beko" electric lamps and a separate net trade price list.

THE RELIANCE TELEPHONE Co., LTD., 12-13, Henrietta Street, W.C.2.—An illustrated folder advertising the company's automatic intercommunication systems.

FRANCIS LAMP LOCKS, LTD., 83, Pall Mall, S.W.1.—A priced and illustrated pamphlet detailing the construction and use of the company's lamp locks.

THE BRITISH THOMSON-HOUSTON Co., LTD., Crown House, Aldwych, W.C.2.—Leaflet R.7335-2, containing illustrations and details of a number of "B.T.-H." radio receiving sets, and the "R.K." loud speaker; and Leaflet R.7432-2, dealing with the company's l.f. transformers, giving performance curves. Both publications are priced.

MESSRS. SMITH & COVENTRY, LTD., Gresley Iron Works, Manchester.—Two well-illustrated publications describing, respectively, a boring, facing, and recessing machine for electric motor frames, and plano-milling machines.

METRO-VICK SUPPLIES, LTD., Trafford Park, Manchester.—A three-colour window poster and a booklet advertising "Cosmos" valves. The booklet gives details, illustrations and prices of ten types with a table summary.

THE GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, W.C.2.—A descriptive pamphlet (B.C. 4352) containing illustrations and details of "Gecophone" h.t. radio battery eliminators for d.c. and a.c.

ELECTRIC FANS, LTD., 53-54, Royal Mint Street, E.1.—An illustrated price list of d.c. and a.c. exhaust fans, regulators, &c.

THE BRITISH THOMSON-HOUSTON Co., LTD., Rugby.—A series of illustrated descriptive pamphlets dealing with auxiliary-current limit switches, truck-type switchgear, earthing resistances, outdoor oil-immersed circuit breakers, switch fuses, and metal-clad compound-filled switchgear.

THE MULLARD WIRELESS SERVICE Co., LTD., Denmark Street, W.C.2.—A series of illustrated and priced pamphlets dealing with "P.M." radio valves.

MESSRS. G. CUSSONS, LTD., The Technical Works, Lower Broughton, Manchester.—An illustrated booklet dealing very thoroughly with the construction and use of the "Scholes" bomb calorimeter.

Bankruptcy Proceedings.

H. A. MILLS, 1, Lorne Villas, Old Windsor, Berks., electrical engineer, &c.—The first meeting of creditors was held recently at 29, Russell Square, W.C.1. The statement of affairs showed liabilities of £452, against assets of £177, leaving a deficiency of £275. Debtor attributed his failure to lack of capital and depression in trade. He commenced to trade without capital in December, 1923, and his wife assisted him. In 1926 he borrowed £200, which he used in the business, and he undertook that the loan was to be secured on the book debts due and to become due. At the date of the receiving order, however, there had been no proper assignment, and no notice had been given to the book debtors, and there was thus no effective charge. Debtor stated that he had carried on business from the commencement with difficulty owing to lack of capital, and a few months ago his wife was taken ill, and he was, therefore, deprived of her services. His creditors began to press him in October last, and an execution was levied on December 18th, 1926, when he decided to file his petition. He became aware of his position in January, 1926. The case, being a summary one, was left with the Official Receiver as trustee of the estate. The following are creditors:—

	£		£
Condor Lamp Co. ...	28	Times Electric Co. ...	55
Filling & Son, W. ...	26	Supra Electrical Co. ...	24
Meares, L. V. N. ...	187		

A. J. CULLUM, 8, Church Street, Diss, Norfolk, motor and electrical engineer.—The public examination of this debtor was held on January 14th, at Ipswich. The statement of affairs showed gross liabilities of £180, and a deficiency of £135. Debtor commenced business in 1922 on his own account without capital. Most of the trade done was repair work, but the profits had never been sufficient to meet the charges. The examination was adjourned.

H. BEBBINGTON, electrical engineer, Cestrian Street, Bolton.—This debtor appeared at Bolton Bankruptcy Court on January 19th for his public examination. Debtor estimated his deficiency at £79. He was formerly in business, and after his wife's death he received a claim for the payment of £108 which he thought had been repaid by his wife during her lifetime. Apart from this amount he owed less than £2. The examination was closed.

J. G. SANDELL, electrical contractor, 20, Hart Road, Dorking.—Receiving order made January 18th on creditor's petition.

F. A. HARTLEY and R. HARTLEY (F. A. Hartley & Son), electrical engineers, 98, Katherine Street, Ashton-under-Lyme, F. A. HARTLEY (separate estate), and R. HARTLEY (separate estate).—Last day for proofs for dividend, February 5th. Trustee, Mr. F. Murgatroyd, Official Receiver, Byrom Street, Manchester.

W. C. RHODES (L. J. Palmer & Co.), electrical engineer and contractor, 141, Newspaper House, Corporation Street, Birmingham. Trustee, Mr. C. Hoult, Official Receiver, 191, Corporation Street, Birmingham, released January 11th.

H. WILSON, electrical contractor, &c., 1057, Grangefield Avenue, Thornbury, Bradford.—Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford, released January 11th.

C. E. F. PARKER, electrical engineer, Greendale, Privett Road, Gosport.—Second and final dividend of 5s. in the £ and 4 per cent. interest, payable at the Official Receiver's offices, 87, High Street, Portsmouth.

Company Liquidations.

CLEARTRON RADIO, LTD.—A meeting of creditors was held at the Institute of Chartered Accountants, Moorgate Place, E.C., on January 26th.

NATIONAL WIRELESS CORPORATION, LTD.—First meeting of creditors and contributories, February 1st, at Carey Street, W.C.

Private Arrangements.

NEUTRON, LTD., wireless accessory manufacturers, Sentinel House, Southampton Row, W.C.—In response to a circular letter issued by Messrs. Booth, Anderson & Co., C.A., of 40-43, Norfolk Street, W.C., a meeting of the creditors was held on January 24th, at the Holborn Restaurant. The circular stated that at a meeting of creditors held on November 26th last the creditors resolved that Messrs. M. D. Booth and T. H. McArthur should represent them on the board to watch the interests of the creditors in connection with the proposals put forward for the discharge by the company of its indebtedness over a period of twelve months. There appeared to be little possibility of the scheme in the form in which it was presented to the meeting of creditors being proceeded with. Mr. Booth occupied the chair, and said that the position had changed materially from that disclosed at the meeting held last November. Messrs. P. G. Marr, Ltd., the second debenture holders, had not taken any steps to jeopardise the position of the company, but they had come to the conclusion that Neutron, Ltd., was no longer of any interest to them for the purposes which they originally intended, namely, the development of their own valves, and the crystal business. Furthermore, Messrs. Marr stated that the business done by the company, in their opinion, did not warrant their acquiring control. Messrs. Marr had, however, made a new proposal for the discharge of the indebtedness to the creditors out of future profits, but he (Mr. Booth) did not consider that he was in a position to accept or reject what was, in fact, an entirely different proposal. The necessary finance to meet wages, &c., during the past few weeks had been provided in part from the sale of crystals in the ordinary course of business, and in part by purchases of crystals made for cash by Messrs. P. G. Marr, Ltd., and Mr. Wolsey, at a price much below that charged to the distributors. He was informed that those crystals could be re-purchased by the company at the same price. A receiver had been appointed by Mr. Bennison, the first debenture holder. Furthermore, the company had sent out a notice convening an extraordinary general meeting for the purpose of liquidation. The proposal of Messrs. Marr was that they should provide for the re-financing of Neutron, Ltd., and the discharge of the creditors' claims out of future profits. So far as he was aware, Messrs. Marr were not prepared to give up their security. Mr. Booth said that if the company was re-financed and had a proper selling organisation it should make very handsome profits. There was some possibility of an order which might bring in a profit running into £1,000 or £2,000. The statement of affairs which was submitted by the solicitor to the company at the previous meeting showed assets of £3,391. The liabilities consisted of debentures for £300 and £3,150. The unsecured trade creditors' debts were scheduled at £4,271. Mr. Latham thought that it would be better if the company was wound up, and a resolution to that effect was carried.

J. W. NUTTALL, electrical and wireless engineer, 668a, Liverpool Road, Ainsdale.—A meeting of creditors was held recently, when it was reported by the debtor that his trade liabilities amounted to £111, while he valued his assets at £82, leaving a deficiency of £27. The debtor stated that he commenced business about two years ago without capital, and one of the creditors provided him with the necessary stock. He attributed his present position to lack of trade and keen competition. He was unable to give any accurate information as to the turnover. The creditors decided that the debtor should be requested to approach his father with a view to making a cash offer, it being intimated that if a composition of 5s. in the £ was forthcoming it would be accepted. The debtor undertook to do this, and also to make efforts to dispose of the business as a going concern. It was decided that no further steps should be taken by the creditors for a fortnight.

Recent Contracts.

The important scheme of the Bristol Corporation for the construction of a large power station at Portishead has received the approval of the Electricity Commissioners, and the City Council has sanctioned the placing of contracts. The main contract for the construction and initial equipment of the station is to be placed with Messrs. Vickers, Ltd. The whole of the electrical plant, comprising the turbo-alternator sets complete with condensers and auxiliaries, and the transformers and switchgear, will be supplied by the Metropolitan-Vickers Electrical Co., Ltd., as sub-contractors. The scheme was planned by Mr. H. Faraday Proctor, city electrical engineer. It provides for a power-station of an ultimate capacity of 280,000 kW, to be built at Portishead, on the Bristol Channel, about seven miles from the city. The first section of the station, on which work has now commenced, will be initially equipped with two 20,000-kW main turbo-alternator sets. Provision will be made to transmit the whole output at 33,000 V to the Corporation power station at Feeder Road, Bristol. The contracts include the necessary transformers and switchgear for feeding the transmitted power into the existing 6,600-V distribution network. Each of the generating sets will consist of a two-cylinder turbine of 20,625 kW maximum continuous capacity and 16,500 kW economical rating, driving at 3,000 r.p.m. a three-phase, 50-cycle alternator of equivalent capacity at 11,000 V and 0.8 power factor, and also a 625-kW house-service alternator generating at 550 V. A three-phase, 25,000-kVA group of single-phase transformers will be permanently coupled to each main alternator for stepping up the pressure to 33,000 V for transmission. The main 33,000-V switchgear will consist of 13 units of the metal-clad type, each unit having a guaranteed breaking capacity of 750,000 kVA. The station boards will also include 45 smaller metal-clad units for the supply circuits of the station auxiliaries. At the Feeder Road power station similar step-down transformers will be installed.

The new sets mark the advance which is being made in the development of generating plant for operation at 3,000 r.p.m., while the boiler pressure of 325 lb. per sq. in. conforms with the increasing preference for pressures over 300 lb. Special arrangements will be made for the taking of the condenser cooling water from the Bristol Channel.

Among the orders recently received by Messrs. John I. Thornycroft & Co., Ltd., are two for omnibus chassis from the Bombay and Rangoon Tramway Companies. They are also supplying a number of wagons for the Buenos Aires Great Southern Railway.

The General Electric Co., Ltd., has received an order from the London Electric Railway for the complete motor and control equipments for 64 motor-coaches and 48 trailer coaches. This is the fourth consecutive order received from the London Electric Railway Co., and the total quantities of equipment ordered from the G.E.C. now comprise motors and control equipment for 159 motor-coaches, 78 driving trailer coaches, and 103 trailer coaches. Each motor-coach equipment comprises two 240-b.h.p. motors (one hour rating), 575 V, together with complete "all electric" contactor-type control gear.

The Birmingham Fair.

We have given so much attention to the arrangements for the forthcoming British Industries Fair that it might be supposed that there would be little more to say until the opening date, but many interesting things were said at a luncheon at the Savoy Hotel, on January 19th, which we should like to report had we the space to spare. The event was organised with the object of expressing the exhibitors' appreciation of the support given to the Fair by the Government and of its appropriation of £25,000 for the second year in succession toward the cost of advertising the Fair. The principal toast, "His Majesty's Government," was given by Sir Hugo Hirst, Bart., who referred to the legislative record of the present Government and to the efforts made to assist and even safeguard British industries. He hoped that the appropriation of £25,000 per annum for the Fair would continue. Sir Hugo carried us back to the days when the Board of Trade was the subject of widespread criticism amongst business men. Well do we recall the days when, for instance, the speaker, having occasion to visit the Board on an electrical matter, searched for two hours before he found the particular department to deal with it—namely, the Fisheries Department! Or, as a further example, the occasion when he inquired for statistics of our imports of electric lamps and found that gas, oil, arc, electric, and all other kinds of lamps were classified as "lamps." Sir Hugo contrasted that state of things with the greatly increased efficiency of the department and its officials to-day, and directed traders' attention to the large store of knowledge that was available at the Board's offices and the readiness with which it was given to those requiring it. He paid a high tribute to Sir Philip Cunliffe-Lister, M.P., the President of the Board of Trade.

Sir Philip, in responding, referred to Sir Hugo Hirst as a very prominent representative of the Birmingham Fair, a great manufacturer, a great salesman, a great Imperial trader, and a great public servant. On behalf of the Government, he congratulated all parties upon the success of the coming Fair. He spoke highly of the work of the committees, and said that the success of the 1927 Fair was based on the cumulative efforts of those who had stood by it in good and bad times. During the coming year business people should keep the next Fair

well to the fore in their correspondence with overseas buyers. The cry "Buy British Goods!" had become a national determination in this country. We must sell British goods in new markets. World trade was expanding as the world settled down, and we must increase our share of that expanding trade. Other countries had yet to tread the path that we had trod back to financial stability. The one thing wanting was salesmanship. We required Peace, Progress, and Trade—that was the Government policy. The speaker went on to allude to the Government policy with regard to China.

Other speakers included Mr. G. C. Vyle, the president of the Association of British Chambers of Commerce, who proposed "The Organisers of the Fair," seconded by Sir Charles Higham, and Sir William Clark, Comptroller-General of the Department of Overseas Trade, Col. H. J. Walduck, the president of the Birmingham Chamber of Commerce, and Mr. T. R. Martin, the chairman of the Birmingham Fair Management Committee. Among other interesting points mentioned by Mr. Martin was a statement to the effect that for the first time the Birmingham section of the Fair would include a complete power house—a co-operative exhibit to which 30 leading firms had contributed.

Electrical Advertising.

Messrs. E. Brook, Ltd., of Empress Works, Huddersfield, whose enterprise in the electric motor manufacturing business has already been referred to in our pages and is well known in the trade, have hit upon an ingenious means for announcing the further reduction in the prices of their motors which came into force on January 1st. A discreetly folded list bears on the outside the words, "It is said," which compel one to open and read further, and the story continues with a still unfinished sentence, "the modern electrical Press," so then we eagerly turn over to find what new thing there is to be said about *us*. Unfolding again, we find that it is no new thing at all, for it has been said occasionally by some quite elementary users of the Press that some journals "contain too many adverts." It may be true of *some* journals—indeed, it surely is, for we wonder why they contain any at all—who is to blame for that? All of Messrs. Brook's interesting ingenuity is intended to induce the reader to turn over again to see the announcement referred to above, and after he has done so, to see other advertisements in the ELECTRICAL REVIEW and certain other journals which are named. We appreciate the compliment, but lest anybody should be led astray by the suggestion that there is too much advertising in the technical Press, we would suggest that he should, when he has opportunity, watch the absorbing interest with which the advertising pages of the ELECTRICAL REVIEW are studied in the offices, trains, club lounges, and homes that he frequents, or when he travels abroad he should call at the consular offices and chambers of commerce and learn how those pages are carefully scanned by overseas buyers to find out the names of the best *British* makers of electric motors and other products. He might even find it interesting to keep lonely vigil outside places where the REVIEW is sold and note the feverish haste with which the proud possessor turns to what are known as "The Smalls"; or to enter some important offices of which we know where the "Official Notice" advertisements of new contracts are searched before the pages have even had a chance to get dry or cold. As a matter of fact, the manufacturer learns much and the buying sections of the profession and industry much more from the careful study of the advertised doings of the trade. The buyer is the last man to complain about the number of announcements put before him; perhaps he is more impressed by one than by another because he is susceptible to brightness, originality and strength in design, but we are anxious that our advertisers should all appear at their best—that is why we have organised advertising competitions. The distribution of a heavy paper may be inconvenient to those who publish it, but who ever heard of a reader complaining that he received too much for his money? He needs a good and complete paper, and for the production of such, in the best interests of the trader, it is essential that it should contain as many announcements as possible from the manufacturers and traders who have goods to sell. We have never heard it argued against the motor Press or the society and fashion papers that there were too many advertisements; indeed, on the contrary, we know that these pages are studied as closely as any part of the paper. So the things concerning which it is written "*It is said*" are sometimes neither new nor true. There used to be some trade publications published containing advertisement sheets only; there are still many publications in which manufacturers waste a considerable part of their advertising allocation for reasons which have nothing to do with real "business-getting." When the trade makes its effective announcements, between one set of covers, which convey the complete truth regarding the course of productive and trading activity to the real buyers everywhere, it gets results, and it no longer remarks about things that are *said*, but states with confidence those things which it *knows*.

Book Notices.

"Aluminium Facts and Figures."—A useful little book, issued by the British Aluminium Co., Ltd., containing a wealth of information concerning numerous products of aluminium, including electrical conductors and cables. Most of the data given are in table form, and the authorities are given for the values under physical properties of aluminium. Aluminium alloys are also dealt with, and various processes appertaining to the preparation of certain articles are described, as are also a number of parts or accessories, such as collector bows for electric railway overhead track work, and numerous sections with their applications.

"Overhead Transmission Lines." Publication No. 193 of the British Aluminium Co., Ltd.—This little book should prove of great value to all those interested in the construction of overhead transmission lines. Much information and many technical data are given upon the actual lines and the accessories. Some interesting illustrations are given of lines in various parts of the world.

"Treatise on Thermodynamics," by Dr. M. Planck, translated by Mr. A. Ogg. Third edition. Pp. xiv+297. London: Longmans, Green & Co., Ltd. Price 15s. net.

Amongst new books published by the D. Van Nostrand Co., New York, is one on "High-Tension Line Practice," by E. V. Pannell, and one on "Household Refrigeration," by H. B. Hull.

"These Hundred Years" is the title of an inspiring oration delivered by Sir Gregory Foster at University College, University of London, reviewing the history of the college, of which the centenary is to be celebrated this year. It has been issued in the form of a brochure, price 1s. net, by the University of London Press, Ltd.

Circular No. 312 of the U.S.A. Bureau of Standards.—United States Government Master Specification for Matting, Rubber, for use around Electrical Apparatus or Circuits not exceeding 3,000 V to Ground. Price 5 cents.—This pamphlet contains the detailed official test requirements for electrical protection mats in the United States.

Bulletin of the British Cast-Iron Research Association. No. 15, January, 1927.

The 1927 volume of "Sell's Telegraphic Address Directory," which is now in the press, will, we are informed, be in an altered form and less bulky than in the past.

Social Events.

The social club connected with the Ayrshire Electricity Board held a successful supper and dance at Kilmarnock last week; Mr. W. C. Bexon, engineer and manager presided. Replying to the toast of "The Employés," Mr. Bexon said that last year their revenue was £194,782, and he hoped, with the operation of the coal clause, they would increase it to a quarter of a million this year. He was satisfied that in the near future there would be a great increase in the consumption of electrical energy.

The staff of Messrs. Ernest F. Moy, Ltd., held its annual dinner on January 15th. The guests included the Mayor of St. Pancras, representatives of electricity supply authorities, and many others. Major C. G. Fox was in the chair, and accepted, on behalf of the board, from the staff and employés a portrait of the late Mr. E. F. Moy, the founder of the company, to whose memory a toast was drunk. A souvenir matchbox bearing a miniature portrait of Mr. Moy was given to everybody present.

On January 21st the annual staff dinner of the Osram-G.E.C. Lamp and M.O. Valve Works was held at the Café Royal, Regent Street. As usual, Mr. C. Wilson occupied the chair, and among those present were Sir Hugo Hirst, Bart., and Mr. C. C. Paterson. After an excellent dinner and the loyal toast, Mr. T. Oldbury proposed the toast of "The G.E.C.," and mentioned the confidence which existed between the directorate and the staff. Sir Hugo Hirst replied in an optimistic manner. Mr. H. C. Wilson proposed the health of the guests, and recalled that the original Osram staff dinner was held in 1895; three or four of those who attended that function were present that evening. Mr. C. C. Paterson, in reply, said that he was glad to be associated with the General Electric Co., Ltd. In that organisation all that was best in initiative found encouragement. Mr. S. Rentell, one of those who were present at the 1895 dinner, replied on behalf of the Press. Mr. E. R. Grant proposed the health of the chairman, to whom, he said, the success of the lamp works was mainly due. Mr. Wilson briefly responded, and stressed the importance of research and the development of the social side. A concert followed, the entertainers being Messrs. E. C. Holmes, L. Richards, H. Herrick, G. O'Hagan, P. Albert, and Miss Rita Barnaby.

The fifth annual staff dinner of Messrs. Francis Polden & Co., Ltd., was held at the Old Bell Restaurant, Holborn, E.C., on January 15th, when one hundred people sat down to an excellent dinner under the chairmanship of Mr. F. C. Polden, the managing director. The speeches and toasts were interspersed with singing, and were followed by a dance.

The General Electric Co., Ltd., announces the following events in connection with its Witton Engineering Works:—Annual Hockey Club dance, January 29th; and annual exhibition, Photographic Club, January 31st.

The staff and friends of the Igranic Electric Co., Ltd., held their annual fancy dress carnival at the Café Dansant, Bedford, on January 14th. There were over 500 guests, the majority of whom were in fancy dress, exhibiting a wide variety of taste and fancy. During the dancing, community singing was indulged in by those present. The dress parade was a gorgeous spectacle, and the decisions of the judges were highly applauded. Eighteen prizes, presented by members and friends of the company, were distributed by Mrs. A. H. Curtis, the wife of the general manager.

For Sale.

By order of the joint receivers and liquidators of Messrs. Eastwood, Swingler & Co., Ltd., iron founders, engineers, &c., in voluntary liquidation, Messrs. Richardson & Linnell will sell by auction on March 8th, at St. James' Sale Rooms, Derby, the freehold property of about 13 acres, situate at Osmaston Road, Derby, formerly used as engineering, &c., works, with the workshops and machinery. Shipley Urban District Council invites offers for two 1,000-kW turbo-alternators, with condensing plant, and two 20,000-lb.-per-hour Babcock & Wilcox water-tube boilers, with chain-grate stokers.

Shoreditch Borough Council Electricity Department invites offers for the dismantling and removal of two 1,500-kW d.c. turbo-generating sets. Messrs. Leopold, Farmer & Sons will sell by auction on February 16th, at the London Auction Mart, 155, Queen Victoria Street, E.C., the modern manufacturing premises known as Arden Works, Pixmore Avenue, Letchworth, with vacant possession. Fuller, Horsey, Sons and Cassell, will sell by auction on February 15th and following day, at the Baltic Exchange, engineers' machine tools, electric motors, &c. (See our advertisement pages to-day.)

German Engineering Workers' Wages Demand.

A delegate meeting of Mannheim metal workers has decided to give notice of denunciation of the present wages agreement and to demand advances of 15 per cent. for skilled and 20 per cent. for unskilled workers. Mannheim is one of the chief centres of German engineering and motor manufacture.—*Reuter* (Mannheim).

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, &c.	Price Jan. 25th.	Fortnight's inc. or dec.
a Acid, Oxalic ... ... per lb.	5¾d.	...
a Ammoniac, Sal ... ... per ton.	£60	...
a Ammonia, Muriate (large crystal) ,,	£32	...
a Bisulphide of Carbon ... ... ,,	...	...
a Borax ... ... ,,	£35	...
a Copper Sulphate ... ... ,,	£25 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4¼d.	...
a ,, Perchlorate ... ... ,,	5½d.	...
a Shellac ... ... per cwt.	£13 10s.	...
a Sulphur, Commercial ... ... ,,	£9 10s.	...
a ,, Roll ... ... ,,	£9 10s.	...
a Soda, Chlorate ... ... per lb.	3½d. to 3¾d.	...
a ,, Crystals ... ... per ton.	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots... ... ... per ton.	£107 to £112	...
b ,, Wire ... ... per lb.	1/6 to 2/-	...
b ,, Sheet ... ... ,,	1/8 to 2/9	...
p Babbitt's Metal and Anti-friction Metal—		
Grade I ... ... per ton net.	£355	£7 dec.
Grade II ... ... ,, ,,	£180	£4 dec.
Grade III... ... ... ,, ,,	£96	£2 dec.
c Brass (rolled metal 2" to 12" basis) per lb.	9¾d.	½d. dec.
c ,, Tubes (solid drawn) ... ,,	11¾d. to 1/-	½d. dec.
c ,, Wire, basis ... ... ,,	9¼d.	½d. dec.
c Copper Tubes (solid drawn) ... ,,	1/0½	½d. dec.
c ,, Bars (best selected) ... per ton.	£90	£2 dec.
c ,, Sheet ... ... ,,	£90	£2 dec.
c ,, Rod ... ... ,,	£90	£2 dec.
d ,, (Electrolytic) Bars ... ,,	£63	10s. dec.
d ,, ,, Sheets ... ,,	£144 10s.	...
d ,, ,, Wire Rods ... ,,	£74 15s.	...
d ,, ,, H.C. Wire per lb.	9½d.	¼d. inc.
f Ebonite Rod ... ... ,,	2/3 to 2/6	...
f ,, Sheet ... ... ,,	2/3 to 2/6	...
a German Silver Wire ... ... ,,	2/3	...
b Gutta-percha, fine ... ... ,,	8/-	...
b India-rubber, Para fine ... ... ,,	1/4½	½d. dec.
l Iron Pig (Cleveland No. 3) ... per ton.	122/6	...
l ,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g Lead, English pig ... ... ,,	£28	£1 dec.
z Mercury ... ... per bot.	£17 10s.	...
e Mica (in original cases) small ... per lb.	3d. to 8/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ... ,,	10/ to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/0½	...
p ,, ,, drawn bars & rods ,,	1/3	...
p ,, ,, rolled strip & sheet ,,	1/2½	...
p ,, ,, wire... ... ... ,,	1/3½	½d. dec.
o Platinum ... ... per oz.	£3[illegible]	...
d Silicium Bronze Wire ... ... per lb.	10½d.	...
r Steel, Magnet, in bars ... ... ,,	7½d.	...
a Tin, Block (English) ... ... per ton.	£291 to £291 10s.	£6 dec.
a ,, Wire, Nos. 1 to 16 ... ... per lb.	4/9	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Under date January 22nd, Messrs. James Forster & Co. reported :—"Arrivals of lead show a tendency to decrease, and, apart from warehouse stocks, there is not too much metal available for early delivery. Demand from consumers this week has been quieter, but a steady consumption of lead is going on. The future is still rather obscure. The weak spot in the position is on the Continent, but last week a better demand was reported from Germany. The price is now at the lowest point touched for four years, and consumers would be well advised to cover their future requirements at the present level of prices."

Lighting and Power Notes.

Bedford.—ELECTRICITY AGREEMENT.—The Electricity Committee has recommended that an agreement be entered into with the Ampthill Urban District Council regarding a supply of electricity to Ampthill, the cost being estimated at £8,750.

Bristol.—LOAN.—The City Council is to apply for sanction to a loan of £31,165 for the laying of two additional cables from the Feeder Road power station and the erection of a substation to meet the increased demand for electricity in the Bristol East district.

Bury St. Edmunds.—OPPOSITION TO BILL.—The Town Council has decided to oppose the Bill being promoted by the East Anglian Electric Supply Co., Ltd., on the ground that one of the clauses would prevent the Corporation from supplying houses on the extended boundaries, and might also prevent it from supplying new streets with electricity for public lighting.

Continental.—SWEDEN.—The change-over from gas to electric lighting of the streets of Gothenburg, which was first commenced in 1922, has now been completed, this city being the first large town in Scandinavia to make such a complete change.

AUSTRIA.—Negotiations have been proceeding for some time past between the Vienna City Council and the Austrian works with the object of extending the municipal electricity works in Vienna. Orders of the value of about 50,000,000 schillings are to be given chiefly to the Siemens-Schuckert, Brown-Boveri, and the A.E.G.-Union companies.

Fleetwood.—ICE-PRODUCING PLANT SUPPLY.—Extensions to a local ice-producing plant, at present worked by steam power, are contemplated, and the company is in negotiation with the Urban District Council with a view to obtaining a supply of electricity. New generating plant for the Council's station has been ordered for several months, and immediate delivery is now promised of the new 2,400-kW set.

Glasgow.—WIRING SCHEME.—The Corporation electricity manager has submitted a report to the Electricity Committee regarding a supplementary scheme for the wiring of houses. The scheme, which is similar to the hire-purchase scheme at present in operation, is that there should be no initial payment on the installation being fitted up, and that the cost of the wiring should be spread over a period of 10 years, the effect of which would be that the quarterly payments would be less than half the payments under the 3-year system, but that there would be a greater total sum to pay in 10 years for interest and maintenance charges. The Property Owners' and Factors' Association has intimated that it would support generally any applications by tenants to wire premises, and is willing to co-operate with the department to ensure wiring agreements being taken over by succeeding tenants. The Committee has recommended that the scheme be adopted.

SUPPLY TO HOUSING ESTATE.—A letter from the Clyde Valley Electrical Power Co., relative to the provision of an electricity supply to the Corporation's Shettleston housing estate, has been considered by the Housing Committee. The estimated cost of overhead lines is £805, and of underground mains, £3,540. The Committee has recommended that the underground system be adopted.

Hawarden.—ELECTRICITY EXTENSIONS.—The Electricity Committee has had under consideration the second instalment of its electricity scheme, as submitted by the Council's consulting engineers (Sir Douglas Fox & Partners). Part of the scheme was approved, and the engineers were requested to revise the parts relating to Broughton and Bretton. The villages of Cymmau, Ffrith and Tryddyn were considered too small and too remote from any existing overhead line to warrant inclusion in the scheme.

India.—MADRAS HYDRO-ELECTRIC SCHEMES.—It is reported that Messrs. Merz & McLellan, consulting engineers to the Indian Railway Board, who were asked to report on the Madras hydro-electric schemes, with special reference to railway electrification in South India, state that while the speeding-up of the hydro-electric programme is essential in view of the lack of fuel near the industrial areas of the south, it would be better to make a beginning in the areas immediately round about the source of power and gradually educate public opinion as to the utility of electrification. They do not recommend the extension of electrification to Madras for the time being, because the rates would be prohibitive owing to the cost of transmission. In these circumstances, the Government of Madras proposes to appoint a committee of officers to tour the area concerned and obtain definite undertakings from consumers of power. As soon as the committee completes its labours, the Government will formulate its policy and place the facts before the Legislative Council.—*Reuter's Trade Service* (Bombay).

Irish Free State.—LIMERICK.—At a recent meeting of the Electricity Committee, the revised draft agreement with Messrs. Siemens-Schuckert for a temporary supplemental supply of electricity from the Shannon works was submitted by the City electrical engineer and approved by the Committee.

Kingussie.—ELECTRICITY SCHEME.—The Town Council has under consideration an electricity scheme for the burgh, and at a recent meeting it was stated that a local company would be formed in the event of the Council's negotiations with the Grampian Electricity Supply Co. proving unsuccessful. In the meantime the Grampian Company has Parliamentary powers to supply electricity to the district, and it is understood that a commencement will be made with its scheme by August next.

Leeds.—LOAN SANCTIONED.—The Corporation has received sanction to a loan of £500,000, which includes provision for the cable-laying and linking-up which will be necessary in connection with the projected new generating station at Kirkstall.

WIRING OF SMALL HOUSES.—The Corporation has approved a recommendation of the Electricity Committee to adopt a scheme of assisted wiring and to operate the clause of the Electricity (Supply) Act for the wiring of premises and sale of appliances.

Lowestoft.—INQUIRY.—The *East Anglian Daily Times* reports that Col. T. C. Ekin, on behalf of the Electricity Commissioners, held an inquiry at the Town Hall on January 18th, into the applications of the Corporations of Lowestoft and Yarmouth, and the Southwold Electricity Supply Co., for Special Orders authorising them to supply electricity in certain areas of Norfolk and Suffolk. Lowestoft Corporation was also applying for sanction to a loan of £53,000 for extensions to its generating station. It was stated that Lowestoft Corporation was prepared to withdraw its application in respect of the Southwold area, and would raise no objection to the Southwold Company's application. A conference was then held between the representatives of the two Corporations, as a result of which Col. Ekin was informed that they had come to an agreement which would obviate all opposition to their applications for extensions to their areas of supply, and would involve the withdrawal of the Lowestoft Corporation's application for sanction to extend its generating station. An agreement had been entered into for the Yarmouth Corporation to provide Lowestoft with a supply of electricity in bulk. The proceedings were then closed.

London.—ST. PANCRAS.—The Borough Council has received sanction to the borrowing of £2,341 for switchgear at the Grafton Road sub-station, and £36,365 for the following purposes:—Mains and services, £25,406; meters, £8,078; wiring installations (for hire), £402; domestic appliances (for hire), £2,479. The Electricity Commissioners have requested the Council to furnish additional particulars in connection with its application for £20,090 for machinery.

ST. MARYLEBONE.—The Electric Supply Committee has recommended that application be made for sanction to loans of £8,000 and £12,000 for mains and services, respectively.

HACKNEY.—The Finance Committee has recommended to the Borough Council that application be made for sanction to a loan of £85,000 as working capital.

Norwich.—OPPOSITION TO BILL.—At a meeting of the City Council, on January 18th, it was decided to oppose the Bill promoted by the East Anglian Electric Supply Co., Ltd., to confer further powers on the company relative to the supply of electricity in the counties of Essex, Norfolk, and Suffolk.

LOANS.—Application is to be made for sanction to loans of £4,500 for the provision of trunk mains to Wymondham, Wroxham, and North Walsham, and £1,800 for transformers and switchgear.

Padiham.—WIRING OF SMALL HOUSES.—The Housing Committee of the Urban District Council has decided to have the new Council houses wired for electric lighting.

Palestine.—THE RUTENBERG SCHEME.—The Jerusalem correspondent of *The Times* reports that the Government has issued the Order for the expropriation of the land required at Jisr el Mejamie for the construction of the dam, power house, and other buildings connected with the Rutenberg scheme for damming the Jordan just south of its exit from the Sea of Galilee for the purpose of providing electricity for the whole of Palestine.

Preston.—LOAN.—The Corporation Electricity Committee has considered a resolution to apply for sanction to borrow £87,000 for the erection of overhead transmission lines between Preston and Blackpool. The Electricity Commissioners have intimated that application for borrowing powers for such work should be made by the Corporations responsible in each case. The Corporation will therefore apply for sanction to borrow £45,775, the estimated cost of the Preston section of the line.

ELECTRICITY SUPPLY.—Within the next few days, the Corporation will inaugurate a supply of electricity to Longton, Hutton, and Howick, distribution being by the overhead system. From the power station electricity will be transmitted by underground cables along the banks of the River Ribble, thence by overhead lines to the transformer station at Longton, and to two other sub-stations. The h.p. lines were erected by Callender's Cable & Construction Co., Ltd., and the l.p. lines by the Corporation. A large number of applications for a supply has been received, and many of the houses have already been wired.

Preesall.—LOAN.—The Urban District Council has applied for sanction to the borrowing of £1,100 for wiring installations and domestic apparatus to be let on hire.

Rawtenstall.—EFFECT OF COAL DISPUTE.—At a meeting of the Town Council on January 20th it was announced that, despite the heavy increase in costs consequent upon the coal dispute, there would be no increase in electricity charges. The advanced price of coal has cost the Corporation approximately £14,000, but a portion of this has been recovered through the coal clause in the contracts with power consumers.

Skegness.—ELECTRICITY SUPPLY.—The Urban District Council has decided not to accept the offer of the Skegness Electricity Supply Co., Ltd., to supply electricity for the bathing pool, orchestral piazza, and the boating lake at 9d. per kWh for lighting and 6d. per kWh for power, but has decided to install its own plant.

Southend-on-Sea.—LINKING UP STATIONS.—The Corporation Electricity Committee has received a report from the electrical engineer, together with estimates for the linking up of the Leigh, London Road and Thorpe Bay power stations. He recommended that the three stations be connected by 11,000-V h.p. mains, and that two 1,000-kW rotary convertors be installed at Leigh and London Road stations, and one of 500-kW capacity at Thorpe Bay station, together with the necessary switchgear, the estimated cost of the scheme being £50,800. The Committee submitted the report to the Electricity Commissioners, and were advised that the size of the mains should be increased from .2 sq. in. to .25 sq. in. The additional cost of .25-sq. in. mains is estimated at £2,000, and the Committee has recommended that application be made for sanction to the inter-connection scheme, and to a loan of £52,800 to cover the cost of the work.

CONSULTING ENGINEER.—The Town Clerk has notified the Committee that he has retained Mr. W. M. Selvey, consulting engineer, to advise the Corporation upon the future supply of electricity in the borough and neighbouring areas.

Sunderland.—ELECTRICAL DEVELOPMENT.—Since the completion of the scheme for laying mains in every street of the borough at Sunderland and the establishment of the hiring and hire-purchase system of lighting installations, new domestic consumers are being added rapidly by the electricity department, and already in the first nine months of the financial year the previous record number has been passed. Many new electrical contractors' showrooms have been opened. The electricity department is now beginning to feel the benefit of the revival of work in the Wear shipyards.

Swansea.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to carry out mains extensions at a cost of £1,250.

PURCHASE OF COOKERS.—The Committee is to purchase 500 electric cookers at a cost of £6,000 for the houses on the Morriston estate.

HEATERS FOR THE MARKET.—The Committee has arranged for the installation of electric heaters at the market stalls.

United States.—ELECTRICAL DEVELOPMENT.—According to *Power*, one of the largest power expansions so far carried out or planned in the greater Pittsburgh area will be undertaken in the near future as a result of the placing of a second contract for a 48,500-kVA turbo-generator to be installed at the Colfax Station of the Duquesne Light Co. by the Byllesby Engineering and Management Corporation. This is the most important plant operated by the Duquesne Light Co., which ordered the two large sets from the Westinghouse Electric and Manufacturing Co. The first order was placed several months ago. In addition to the two turbo-generators, which will have a combined output of approximately 120,000 h.p., the contracts call for two steam condensers of 62,500 sq. ft. each, as well as a 100,000-kVA bank of transformers to operate at 84,300 V. Included in the auxiliary equipment are 26 circuit breakers, 10 of which set a record for this type of apparatus. These, which are said to have the largest interrupting capacity of any breakers ever built, are rated at 2,650,000 kVA at 11,000 volts. Including the main generating units and all auxiliary equipment, the two contracts call for a total outlay of approximately $2,000 000. At the present time there are in operation at the Colfax Station four turbo-generators, totalling 210,000 kVA. When installed next year the two additional units will raise the generating capacity to approximately 300,000 kVA.

West Riding.—ELECTRICITY BILL.—Reporting upon the Yorkshire Electric Power Bill, the West Riding County Council states that many new powers are sought, the chief of which is to apply for Special Orders to supply electricity in bulk outside the company's limits of supply. Under its existing powers the company can only supply electricity for lighting to authorised distributors, and cannot, except in special circumstances, supply it direct to consumers, but if the powers now sought are granted, it will be able to apply for an Order for the distribution of electricity for lighting in any district in which a Special Order is not already in operation. The views of the District Councils' Association have been invited.

Wrotham (Kent).—PROPOSED ELECTRICITY SUPPLY.—The Urban District Council has received a communication from Mr. T. Stevens, of Lincolns Inn Fields, London, asking, on behalf of a client, whether the Council proposed to develop any scheme of electricity supply for the district, and, if not, whether it would support the establishment of a company to carry out a scheme. The matter has been referred to a committee for consideration and report.

Tramway and Railway Notes.

Bradford.—OPPOSITION TO BILL.—Since the approval by a ratepayers' meeting, on January 14th, of the Corporation's Parliamentary Bill for powers to extend its railless-car and motor'-bus services within and without the city, considerable opposition has been raised. Three petitions to be presented in Parliament against the Bill will be (1) from the Bradford Chamber of Trade, Property Owners' Association, and motor-'bus and transport proprietors' associations; (2) the Yorkshire (Heavy Woollen District) Tramways Co.; and (3) a combination of 'bus proprietors already serving areas outside the city which are affected by the Corporation's proposed extended 'bus routes. Several urban and parish councils in the Wharfedale area are opposing the Bill, and the West Riding County Council has declared its intention to oppose it unless terms are come to with the Corporation.

Continental.—SWITZERLAND.—Work on the electrification of the Federal Railway between Puidoux and Rupperswil has been completed, and the electrical supply for the line was inaugurated on January 18th. Electricity is supplied at a pressure of 132,000 V.

The electrification work on the section of the railway between Feldkirch and Buchs in the Tyrol which is being jointly worked by the Swiss and Austrian State Railway authorities has recently been completed, and is now in operation.

ITALY.—A contract has been signed at the Ministry of Communications for the construction of hydro-electric plants in the Borbera Valley to supply electricity to the Piedmont, Ligurian, Lombard, and Emilian group of railways. The contract is the result of an agreement arrived at between the State Railways, the provincial administration of Alessandria, and the Società Elettrica Interregionale Cisalpina, of Milan. The scheme includes the construction of a large artificial lake with a capacity of 160,000,000 cu. m. The lake will yield, by means of two falls of an aggregate height of 220 metres, about 20,000 h.p.—*Reuter's Trade Service* (Milan).

Croydon.—ABANDONMENT OF TRAMWAY.—At a meeting of the Borough Council, on January 24th, it was decided to cease working the Addiscombe tramway route after March 31st next. The track is worn, and complaints as to its condition have been received. The estimated cost of reconstruction was £50,000.

Increase of Charges.—The Minister of Transport has made Orders under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, authorising certain fare changes by the following tramway and light railway authorities:—The Corporations of Kirkcaldy, York, Maidstone, Colne, Haslingden, Burton-on-Trent, Accrington, Barrow-in-Furness, Preston, Burnley, Luton, Dundee, and Gloucester, the Urban District Councils of Pontypridd, Barking Town, and Aberdare, and the Kidderminster and Stourport Electric Tramways Co., Norwich Electric Tramways Co., Scarborough Tramways Co., Musselburgh and District Electric Light and Traction Co., Ltd., Bath Electric Tramways Co., Hastings Tramways Co., Dundee, Broughty Ferry and District Tramways Co., Llandudno and Colwyn Bay Electric Railway, Ltd., Llanelly and District Electric Supply Co., Ltd., Cheltenham and District Light Railway, and London United Tramways, Ltd. These Orders will remain in force until December 31st next.

India.—RAILWAY ELECTRIFICATION.—According to *Indian Engineering*, the G.I.P. Railway has decided to erect an independent power station in connection with its scheme to electrify the lines between Bombay and Igatpuri and Bombay and Poona. The site has been chosen at Kalyan. The cost of building and equipping the station is estimated at Rs.100 lakhs, of which Rs.90 lakhs will be spent on generating plant and transmission lines. The order for these will be placed in England through the High Commissioner for India.

London.—"UNDERGROUND" DEVELOPMENTS.—The Underground Group has issued a report, giving details of the progress made on its undertakings during the past year, and works in progress or contemplated during the current year. The most important contribution during 1926 was the extension of the City line from Clapham Common to Morden, and the linking up of the Hampstead and City railways between Charing Cross and Kennington. Approximately 16,000,000 passengers have been carried on these extensions since their opening in September last. Lifts at various stations were replaced by escalators, and there are now 61 escalators in use. A number of ticket and change-giving machines were introduced, and passimeters have superseded the old type of booking office at eight stations. New rolling stock included 194 cars, most of which were required for the Morden line service. A general scheme for remodelling the existing C.L.R. rolling stock was commenced, and a few of the reconditioned cars are now in use on this line. On the tramways a new type of car was introduced, fitted with upholstered cross seats, and 46 of these cars were put into service during the year on the M.E.T. and L.U.T. systems. During the present year the reconstruction of Bond Street, Blackfriars, and Temple stations will be completed, and additional escalators installed at a number of stations. There will be 72 escalators in operation by the end of the year. Extensions of the Acton works will be completed during the year, another 25 new cars will be put into service, and all the 300 remodelled cars on the C.L.R. and Hampstead lines will be completed. New tramcars are to be put into service, and an entirely new type of tramcar, of which details will shortly be announced, is to be introduced.

STOKE NEWINGTON.—The Borough Council has received a letter from the chief general manager stating that, having regard to all the circumstances existing at the present time, the London & North-Eastern Railway Co. does not contemplate electrifying the Liverpool Street-Enfield line in the immediate future.

Swansea.—MUMBLES LIGHT RAILWAY.—The Corporation Tramways Committee is urging the Swansea Improvements and Tramways Co. to proceed with the electrification of the Mumbles railway as soon as possible.

United States.—RAILWAY ELECTRIFICATION.—The Electric *Railway Journal* states that the Chicago, South Shore, and South Bend Railroad is to carry out improvements to its system during the present year at an approximate cost of $2,000,000, which will include new cars, construction, and other extensions of facilities. Work carried out during 1926 included the changing-over from a.c. to 1,500-V d.c., the construction of eight sub-stations, four of which are mercury-arc rectifier stations, and the reconstruction of the overhead system.

Telegraph and Telephone Notes.

Italy.—SWEDISH TELEPHONES.—Mr. Piltz, principal of the undertakings of the L. M. Ericsson Co. in Italy, states that progress is being made not only in connection with the concession company in the South of Italy, but also with the Società Ericsson Italiano, which was formed in Genoa last year. The area of the concession comprises a district in the south about a line drawn between Naples and Rome, and since the company took over the concession in July, 1925, the number of subscribers has increased from 17,700 to 20,376 last October. The Genoa company has also obtained contracts for deliveries for the other four concession districts.

Radio at Sea.—RECORD SHORT-WAVE TRAFFIC.—The Cunard liner *Carinthia*, which is at present engaged on a round-the-world pleasure cruise from New York, has just achieved record-breaking commercial communication between ship and shore. When off Cape Leeuwin, Australia, she worked with the New Brunswick station, New Jersey, owned by the Radio Corporation of America, at a distance of nearly 12,500 miles. Before leaving this country, the vessel was fitted with a special short-wave transmitting and receiving installation manufactured by Messrs. Siemens Bros. & Co., Ltd., Woolwich, at the request of the shipowners. The apparatus was specially designed for the ship, and arrangements were made in the installation to permit tests to be carried out with a view to ascertaining the most favourable arrangements and most appropriate wave-lengths. A special single-wire aerial was erected to which the transmitter was inductively coupled, but arrangements were also made so that the ship's main aerial could be employed as an alternative. The transmitter has a wave range of from 25 to 50 metres and employs a specially-constructed 500-watt anode dissipation (intermittent rating) valve, capacity-reaction being employed to control the oscillations. The necessary high-voltage can be obtained either as rectified a.c. from the vessel's long-wave continuous-wave transmitter, or from a specially-designed d.c./d.c. high-voltage machine installed underneath the operating table. Low-voltage for the filament is obtained either from the long-wave c.w. transmitter or from a special winding on the machine referred to above. The whole of the transmitting gear is mounted in a wooden case, which is metal lined for screening purposes. The receiver consists of a simple single-valve circuit thoroughly screened. Special precautions have been taken to minimise any local effects, *e.g.*, the operator manipulating the tuning devices. The instrument covers a range of from 10 to 100 metres, and can be coupled with the ship's low-frequency amplifier in order to intensify signal strength, if necessary. Through the co-operation of the British Post Office, arrangements were made for traffic to be worked through its research station at Dollis Hill, and the Radio Corporation of America also arranged for messages to be transmitted from and received at its stations at New York and San Francisco. During the Christmas season the *Carinthia* despatched 700 greetings by wireless direct to the Radio Corporation's American stations when the vessel was approaching New Zealand, at an average distance of about 10,000 miles. She is the first British vessel to handle commercial messages on short waves (*i.e.*, under 100 metres) with a British Post Office station.

Turkey.—TELEPHONE CONCESSION.—An agreement has been made between the city of Smyrna and the L. M. Ericsson Co., granting a concession for 35 years for the installation and operation of a telephone service in Smyrna and the surrounding district. A special company with a capital of about $212,000 has been formed, says *Commerce Reports*, with the city and the company as shareholders. The first telephone station, which will be automatic, will begin with 2,000 lines, to be enlarged later to 10,000.

Venezuela.—WIRELESS-TELEGRAPHY.—The Government has bought about 118 acres of high-lying land for a radio-telegraph station in the Cutia sub-division of the Federal District (population 140,000), at a cost of 600,000 bolívares (1 bolívar = 9½d.)—*Reuter's Trade Service* (Caracas).

Radio Notes.

Australia.—DISPUTE OVER ROYALTIES.- Wireless dealers in Melbourne and Sydney have formed a co-operative company to contest the demands of Amalgamated Wireless (Australasia), Ltd., which claims a royalty on apparatus covered by 145 patents.—*Reuter* (Melbourne).

Austria.—NEW STATION.—It is understood that the official inaugural ceremony of the Klagenfurt station, wave-length 272.7 metres, will take place on January 30th; this is claimed to be one of the best relay transmitters in Europe.

Germany.—NEW STATION.—The official inauguration of the Langenburg station took place on January 15th, the programme being broadcast from Cologne and relayed from the new station.

POWER RATING.—According to *World Radio*, though the power and range of all the following German stations remain unaltered, their transmitting strength will from now onwards, in accordance with the agreement recently concluded at Geneva, be stated as follows:—

	Wave-length.	Old kW figure.	New kW figure.
Koenigswusterhausen	1,300	10	8
Frankfurt (Main)	428.6	10	4
Hamburg	394.7	10	4
Leipzig	365.8	9	4
Münster	241.9	3	1.5

The low-power stations, Elberfeld (468.8 m.), Bremen (400 m.), Hanover (297 m.), Dresden (294 m.), Dortmund (283 m.), Cassel (272.5 m.), Kiel (254.2 m.), and Gleiwitz (250 m.), hitherto represented by 1.5 kW, will now have each 0.7 kW. Langenberg will have 25 kW, instead of 60 on the old basis.

Licences.—STEADY INCREASE.—The number of licences issued for the use of broadcast receiving sets is still increasing. The total on January 1st was 2,179,000, representing an increase of 48,000 during December, 1926.

Poland.—LICENCES.—The Commercial Secretary at Warsaw (Mr. R. E. Kimens) has forwarded to the Department of Overseas Trade statistics from which it appears that, although the number of licences increased from 4,977 in 1925 to 34,556 in 1926, the number of dealers in, and manufacturers of, wireless plant decreased from 269 to 239, indicating that Poland has also experienced the usual process common to the initiation of a wireless industry, in that numbers of small firms which had gone into the business lacking both experience and capital, have not been able to withstand even favourable conditions.

South Africa.—STATION TO CLOSE DOWN.—It is officially announced that JB, the Johannesburg broadcasting station, is to close down on the 31st inst.—*Reuter* (Johannesburg).

Mr. I. W. Schlesinger has offered, on behalf of African Theatres, Ltd., to undertake the management of a new company to control wireless broadcasting in the Union. This is considered by many to be the only possible solution of the existing financial problem, says *The Times*. Mr. Schlesinger's offer envisages broadcasting as a national concern. The next move therefore lies with Cape Town and Durban, where the other broadcasting stations of the Union are situated. There is some doubt whether they are willing to fall into line, but negotiations are in progress between the three stations and the Minister of Posts and Telegraphs. It is evident that the most stringent regulations affecting the sale and use of apparatus should be laid down, and that the strongest possible measures should be adopted by the Government to eliminate unlicensed listeners before broadcasting can be placed on a really satisfactory basis in that country.

Santo Domingo.—NEW STATION.—A broadcasting station, the first of its kind in the Dominican Republic, is shortly to be erected at Monte Cristy in accordance with plans adopted by the Minister of Promotion and Communications. A preliminary grant of 30,000 dollars has been provided for in the 1927 Budget for the installation of a 1,000-watt station. Broadcasting is to be used for literary, scientific, and other educational purposes, and as a means of propaganda for commercial, agricultural, and sanitary measures.—*Reuter's Trade Service* (Santo Domingo).

Wave-lengths.—MORE CHANGES.—On Sunday, January 23rd, the B.B.C. indulged in another re-shuffle of station wave-lengths, those affected being enumerated below:—

Station.	Old wave-length, metres.	New wave-length, metres.
Birmingham	491.8	326.1
Bournemouth	326.1	491.8
Bradford	254.2	252.1
Edinburgh	294.1	288.5
Hull	288.5	249
Stoke	288.5	249
Dundee	288.5	249
Swansea	288.5	249

The 249-m. wave is the international common wave-length.

Several Continental stations, besides those in this country, have changed and exchanged wave-lengths for test purposes recently.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Armthorpe (Yorkshire).—February 15th. Education Department. Electric lighting installation at new school. Education Committee, West Riding County Hall, Wakefield.

Argentina.—BUENOS AIRES.—March 15th. Ministry of Marine. Machinery in connection with the extension of electrical generation (involving the enlargement of two existing power stations and the construction of two new ones) at the Naval Base, Puerto Belgrano. (B.X. 3140.)*

March 24th. Department of Navigation and Ports. Electric cranes, pumps, &c. (A.X. 4087.)*

Australia.—MELBOURNE.—March 14th. City Council. 6,600-V, 3-phase switchgear. (B.X. 3138.)*

March 8th. Postmaster-General's Department. Induction coils and registers. (B.X. 3136); testing instruments (B.X. 3132.)*

March 1st. Accumulators and plates. (B.X. 3170)*; motor-generator sets. (B.X. 3172.)*

March 7th. State Electricity Commission of Victoria. Paper-insulated lead-covered control cable. (B.X. 3137.)*

March 14th. D.c. switchgear and accessories. (B.X. 3131.)*

SYDNEY.—March 9th. New South Wales State Railways. Two sets of electric overhead travelling crane equipments. (A.X. 4103.)

Belfast.—February 5th. Electricity Department. One induction motor-driven vertical type centrifugal pump. (January 21st.)

February 18th. Electricity Department. Twelve months' supply materials, including electrical accessories, lamps, carbon brushes, cables, &c. (See this issue.)

Bristol.—February 18th. Electricity Committee. Coal and ash-handling plant, and railway sidings; circulating-water screening plant. (See this issue.)

Clacton.—February 2nd. Electricity Department. Two 1,125-b.h.p. Diesel oil engines, direct coupled to 750-kW, 3-phase alternators; two 750-kW alternators, two rotary-convertors, and e.h.p. switchgear. (January 21st.)

Douglas.—February 28th. Corporation. 3½ miles of e.h.p. cable, two synchronous motor alternators. (January 21st.)

Dundee.—February 21st. Electricity Department. Two water-tube boilers with superheaters, economisers, mechanical stokers, and coal-handling plant. (See this issue.)

Eastbourne.—February 21st. Electricity Department. E.h.p. cable, static transformers, and e.h.p. switchgear. (See this issue.)

Edinburgh.—February 14th. Electricity Supply Department. E.h.p. and l.p. switchgear, e.h.p. and pilot cables. (January 21st.)

January 31st. Corporation. Structural steel work for extension of turbine house, Westbank, Portobello generating station City architect.

Greenock.—February 2nd. Corporation. Electric lighting installation at eight tenements (48 apartments). Schedules from Public Works Office.

Huddersfield.—February 19th. Town Council. Electrician's work at maternity home, Greenhead Road. Borough Architect, 26, Ramsden Street.

Ilford.—February 1st. Electricity Department. 660-V, l.p. paper-insulated cables. (January 21st.)

Leeds.—February 18th. Electricity Department. Twelve months' supply of stores, including cables, mains boxes and fittings, jointing and insulating materials, &c. (See this issue.)

London.—LONDON COUNTY COUNCIL.—January 31st. Electrical installation at the Hornsey Rise housing estate (approx. 1,100 wiring points). (January 21st.)

HAMMERSMITH.—February 16th. Electricity Department. Twelve months' supply of stores, including several electrical items. (January 21st.)

SHOREDITCH.—February 23rd. Electricity Department. One 1,500-kW automatic sub-station converting equipment and one 20-ton electrically-operated overhead travelling crane. (See this issue.)

Macclesfield.—January 31st. Rural District Council. Electric generating plant to supply 24 houses at Gawsworth, consisting of engine, battery, switchboards, cable, small motor and pump; wiring for electric light installation, including lamps and meters. Mr. Geo. Clayton, architect, 4, Wellington Street, Stockport.

Manchester.—January 31st. Electricity Department. Two electrically-driven circulating-water pumps, piping, &c. (January 14th.)

January 31st. 12,000 yd. of 3-in. weldless steel spigot and faucet tubes; street lanterns. Mr. H. C. Lamb, chief engineer and manager, Electricity Department.

February 4th. One 1,500-kW and one 750-kW motor convertors, with switchgear. (January 21st.)

New Zealand.—AUCKLAND.—March 22nd. Harbour Board. Electric motors, gearing, shafting, and control gear for the operation of vehicular and passenger gangways at the New Devonport Ferry Wharf. (A.X. 4102.)*

WELLINGTON.—March 4th. Poverty Bay Electric Power Board. Switchgear and transformers. (B.X. 3160.)*

Peterborough.—February 28th. Electricity Department. One 12,000-kW turbo-generator, with foundations, condensers, air and extraction pumps, air cooler, oil cooler, and pipework, e.h.p. switchgear, coal-handling plant, &c. (See this issue.)

Portsmouth.—Electricity Department. Coal-handling plant. (See this issue.)

Salford.—February 4th. Electricity Committee. Steelwork for electricity showrooms, Chapel Street. Mr. C. Swain, architect, 12, Exchange Street, Manchester.

South Africa.—JOHANNESBURG.—February 10th. Municipal Council. Electric cable. (B.X. 3130.)*

Spalding.—February 26th. Urban District Council. 28 sets of centrifugal pumps (for sewage pumping), including electric motors, automatic starters, floats, valves, pipes, &c. Mr. C. F. Murphy, Lloyd's Bank Chambers, Morpeth.

Stoke-on-Trent.—February 9th. Electricity Department. Steam and water piping, valves, &c., constructional steel work, platforms, crane gantries, &c. (January 7th.)

Static transformers, sub-station switchgear. See this issue.)

Tilbury.—February 12th. Urban District Council. H.t. underground cables, l.p. distribution mains, house services, transformers, h.p. and l.p. switchgear and conversion of public street lamps. (See this issue.)

Torquay.—Electricity Department. Two vertical circulating-water pumps for Newton Abbot power station. (January 21st.)

Uruguay.—MONTEVIDEO.—March 2nd. State Electricity Works. Lead fuse wire, silver fuse wire, switches, cable end boxes, compound and insulating type. (B.X. 3159.)*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Blackpool.—Housing Committee.

Wiring 112 houses on the "J. & P." wiring system.—R. Darbyshire, Ltd.

Brighton.—Lighting Committee. Accepted:—

Turbine with Metropolitan-Vickers alternator and Vickers, Ltd., condenser (£53,840).—Richardsons, Westgarth and Co., Ltd.

Tramways Committee. Accepted:—

120 tons steel girder tram rails (£1,329).—Cargo Fleet Iron Co., Ltd.

Douglas (I. of M.).—Electricity Committee. Accepted: 400 tons fuel oil (92s. 6d. per ton).—Anglo-American Oil Co., Ltd.

Glasgow.—Corporation. Recommended:—

Installation of electric lighting in Govan Registration Office.—J. Cunningham.

Electrical installation at Possil housing scheme (£1,723).—R. J. Sinclair.

Tramways Committee. Recommended:—

Lead-covered cable.—Standard Telephones & Cables, Ltd.; Hackbridge Cable Co., Ltd.

Government Contracts.—The following contracts were placed by various Government departments during December, 1926:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).

Aluminium sheets.—British Aluminium Co., Ltd.
Battery fittings.—Chloride Electrical Storage Co., Ltd.
Junction boxes.—Hawkers, Ltd.; Pinnacle Switchgear, Ltd.; General Electric Co., Ltd.
Electric cable.—Enfield Cable Works, Ltd.; General Electric Co., Ltd.; Macintosh Cable Co., Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephone and Cables, Ltd.; British Insulated Cables, Ltd.
Cells.—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.
Electric heating elements.—Credenda Conduits Co., Ltd.
Table fans.—General Electric Co., Ltd.
Insulating materials.—Connollys (Blackley), Ltd.; Ioco Rubber & Waterproofing Co., Ltd.; McBean & Co
Electric lamps.—General Electric Co., Ltd.; British Thomson-Houston Co., Ltd.; Edison Swan Electric Co., Ltd.; Siemens & English Electric Lamp Co., Ltd.; Metro-Vick Supplies, Ltd.
Micanite.—Micanite & Insulators Co., Ltd.; Mica and Micanite Supplies, Ltd.; Mica Products, Ltd.; R. Whiffen, Ltd.
Motor-generating set.—Harland Engineering Co., Ltd.
Motors.—Laurence Scott & Co., Ltd.
W/t transmitters and keys.—Gambrell Bros., Ltd.
W/t valves.—Mullard Radio Valve Co., Ltd.; General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.
Copper wire.—Ward & Goldstone, Ltd.; Connollys (Blackley), Ltd.; Concordia Electric Wire Co., Ltd.; British Insulated Cables, Ltd.
Enamelled copper wire.—British Insulated Cables, Ltd.
X-ray apparatus.—A. E. Dean & Co.

WAR OFFICE.

Aluminium ingot.—British Aluminium Co., Ltd.
Submarine cable.—Standard Telephones & Cables, Ltd.
Petrol-electric crane.—Ransomes & Rapier, Ltd.
Electric light conduit and fittings.—General Electric Co., Ltd.
Generating sets.—W. H. Dorman & Co., Ltd.

AIR MINISTRY.

Inert batteries.—Siemens Bros. & Co., Ltd.
Storage batteries (Henlow).—Hart Accumulator Co., Ltd.
Dynamometer.—Laurence Scott & Co., Ltd.
Switch boxes.—Plessy Co. (1925), Ltd.

POST OFFICE.

Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; Ericsson Telephones, Ltd.; Peel-Conner Telephone Works, Ltd.; Siemens Bros. & Co., Ltd.
Telegraph apparatus.—Creed & Co., Ltd.
Testing, protective and miscellaneous apparatus.—T. Watson.
Telephone cabinets.—W. A. Collins, Ltd.
Cable.—British Insulated Cables, Ltd.; Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; General Electric Co., Ltd.; W. T. Glover & Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Standard Telephones & Cables, Ltd.; Union Cable Co., Ltd.
Joint-box castings.—General Foundry & Eng. Co., Ltd.
Loading coils.—General Electric Co., Ltd.
Ebonite.—Sterling Telephone & Electric Co., Ltd.
Flameproof wire.—Macintosh Cable Co., Ltd.
Bronze wire.—T. Bolton & Sons, Ltd.; British Insulated Cables, Ltd.; Elliotts Metal Co., Ltd.; R. Johnson and Nephew, Ltd.; Shropshire Iron Co., Ltd.; F. Smith and Co., incorporated in the London Electric Wire Co. & Smiths, Ltd.
Replacing battery, Grimsby automatic telephone exchange.—D.P. Battery Co., Ltd.
Manufacture, supply, drawing-in and jointing cable (Dewsbury-Wakefield).—British Insulated Cables, Ltd.
Telephone exchange equipment.—Buckhurst, Worcester: General Electric Co., Ltd. Fforestfach (Swansea multi-exchange area), Dunlop Rubber Co., Ltd. (S.W.); Siemens Bros. & Co., Ltd. Sub-contractors: Small Electric Motors, Ltd., for dynamotor. Kay, Son & Co., Ltd. (E.C.), Rochdale: Standard Tele-

phones & Cables, Ltd. Sub-contractors: Chloride Electrical Storage Co., Ltd., for batteries, Crompton and Co., Ltd., for machines. Morrison & Co., Ltd. (Glasgow), Illustrated London News and Sketch, Ltd. (W.C.), Bristol Corporation, W. S. Crawford, Ltd. (W.C.), Crabtree & Co., Ltd. (Walsall), G. & R. Dewhurst (1926), Ltd.: Relay Automatic Telephone Co., Ltd.

Telephone repeater equipment, G.P.O. (South).—Standard Telephones & Cables, Ltd.

Telephone repeater station power plant (Glasgow).—Newton Bros. (Derby), Ltd.

CROWN AGENTS FOR THE COLONIES.

Battery materials.—Siemens & General Electric Railway Signal Co., Ltd.

Telephone switchboard.—Relay Automatic Telephone Co., Ltd.

Train-lighting equipments.—J. Stone & Co., Ltd.

H.M. OFFICE OF WORKS.

Wiring Edinburgh Castle.—A. & J. Morgan, Ltd.

Hamilton.—Town Council. Accepted:—

New switchboard at the burgh electricity works.—Metropolitan-Vickers Electrical Co., Ltd.; cables (£1,229), Edmundson's Electricity Corporation.

Hythe (Kent).—Town Council. Accepted:—

Tenders in connection with the erection of 68 houses:—

Wiring and fittings (£377).—Flack & Johnson.

Cable work (£238).—Folkestone Electric Supply Co., Ltd.

Irish Free State.—DUBLIN.—Commissioners of Public Works.

Heating and electric lighting installation, Ballyconnell House Preparatory College.—Haden's Engineering Co., Ltd.

Vacuum cleaning plant, Custom House, Dublin.—A. H. Masser (Sturtevant Eng. Co., Ltd.).

Extension of electric lighting at the Phœnix Park Ordnance Survey Office.—Handley & Robinson, Ltd.

—*Irish Builder and Engineer.*

Controller of Stores (Posts and Telegraphs).

Bell sets.—Siemens Bros. & Co., Ltd.

Bells (telephone).—Phœnix Telephone and Electric Works, Ltd.

Cable.—W. F. Dennis & Co.; W. T. Henley's Telegraph Works Co., Ltd.; Victor Zorn (C. J. Vogel, Coepenick).

Electric torches.—Edison Swan Electric Co., Ltd.

Generators (telephone).—Peel-Conner Telephone Works.

Indicators (telephone).—Phœnix Telephone and Electric Works, Ltd.

Insulators, various.—W. F. Dennis & Co.; Litholite Insulators, Ltd.; Goerz Bros. and Kellie (Ireland), Ltd.; General Electric Co., Ltd.

Telephone jacks.—Phœnix Telephone and Electric Works, Ltd.; Ericsson Telephones, Ltd.

Telephone keys.—Sterling Telephone and Electric Co., Ltd.

Monophones, various.—Theodore Gary & Co.

Valves (wireless).—General Electric Co., Ltd.; Marconi (Ireland), Ltd.

Wireless parts.—Marconi's Wireless Telegraph Co., Ltd.

Wire.—Concordia Electric Co., Ltd.; Hayward Co.

—*Irish Electrician.*

Dublin United Tramways Co.

Traction lamps.—Edison Swan Electric Co., Ltd.

London. — METROPOLITAN WATER BOARD. — Works Committee. Two steam-driven electric generators (one 100 kW and one 50 kW), switchboard, piping, &c., for Kempton Park pumping station:—

E. S. Hindley & Sons	£2,135
Ashworth & Parker. (Accepted.)	**2,283**
W. H. Allen, Sons & Co., Ltd.	2,480
James Howden & Co., Ltd.	2,486
Mather & Platt, Ltd.	2,554
Browett, Lindley & Co., Ltd.	2,549
Belliss & Morcom, Ltd.	2,749
E. Reader & Sons, Ltd.	2,750
Peter Brotherhood, Ltd.	2,792
General Electric Co., Ltd.	2,848

SHOREDITCH.—Electricity Committee.

Electrical installation at Horner House (£1,124).—Electrical Installations, Ltd. (in place of tender of Messrs. Toy & Winslow, £1,042, withdrawn).

STEPNEY.—Electricity Supply Committee.

20 tons pitch (£141).—Gas Light & Coke Co. (Accepted.)

50 cast-iron chambers, frames and covers (£142).—E. and F. Wright. (Accepted.)

Fifty 2-way t c/c disconnecting boxes (£105).—Universal Electrical Mfg. Co. (Recommended.)

Six 1,500-kW motor-convertors and switchgear for sub-stations:—

Ateliers de Constructions Electriques de Charleroi. (Recommended.) ...	**£14,900**
Metropolitan-Vickers Electrical Co., Ltd. ...	52,199
English Electric Co., Ltd.	52,839
General Electric Co., Ltd.	56,367
British Thomson-Houston Co., Ltd.	61,090
Bruce Peebles & Co., Ltd.	67,137

AIR MINISTRY.

"Mazda" metal-filament lamps.—British Thomson-Houston Co., Ltd.

Preston.—Electricity Committee. Recommended:—

Transformer equipment for sub-stations (£4,188); fuses and fittings (£1,000).—English Electric Co., Ltd.

Sheffield.—Electricity Committee. Accepted:—

Three e.h.p. feeder switches and alteration to existing equipment at Neepsend generating station (£4,025).—A. Reyrolle & Co., Ltd.

Tramways Committee. Accepted:—

500 steel tramcar tires (£1,706).—Vickers, Ltd.

Southend-on-Sea. — Electricity Committee. Recommended:—

Meters (£3,227).—Chamberlain & Hookham, Ltd.

Tynemouth.—Electricity Committee. Accepted:—

Six lots of cable.—Macintosh Cable Co., Ltd.

Feeder pillar.—British Insulated Cables, Ltd.

Forthcoming Events.

Junior Institution of Engineers.—Friday, January 28th. London. 7.30 p.m. "Design of High-Pressure Sub-Stations." Mr. C. E. Atkinson.

Friday, February 4th. "Theory of the Gyroscopic Compass." Mr. F. R. Jackson.

Physical Society.—Friday, January 28th. Imperial College of Science, S.W.7. 5 p.m. Ordinary meeting.

Birmingham Electric Club.—Friday, January 28th. Grand Hotel. 7 p.m. Presidential address.

Institution of Engineering Inspection.—Friday, January 28th. Royal Society of Arts. 7.30 p.m. "Manufacture and Uses of Arsenical Copper." Mr. J. Taverner.

Electrical Society of Glasgow.—Tuesday, February 1st. 30, Gordon Street, Glasgow. 7.30 p.m. "Electric and Hydraulic Lifts." Mr. J. H. Meacock.

National Association of Supervising Electricians.—Tuesday, February 1st. Junior Institution of Engineers. 7.15 p.m. "Possibilities of Development of Water Power in Great Britain and Ireland." Mr. G. L. Addenbrooke.

Paisley Association of Electrical Engineers.—Tuesday, February 1st. Town Hall. 7.30 p.m. "Street Lighting." Mr. J. E. Adam.

Roentgen Society.—Tuesday, February 1st. 32, Welbeck Street. 8.15 p.m. Ordinary scientific meeting.

Institution of Mining Engineers.—Wednesday, February 2nd. Institution of Mechanical Engineers, London. 11 a.m. Annual general meeting.

Institution of Electrical Engineers.—Thursday, February 3rd. London. 6 p.m. "Some Recent Advances in A.C. Measuring Instruments." Lieut.-Col. K. Edgcumbe and Mr. F. E. J. Ockenden.

(Wireless Section).—Wednesday, February 2nd. London. 6 p.m. "The Purpose and Design of Broadcast Receivers." Mr. C. F. Phillips.

(Mersey and North Wales (Liverpool) Centre).—Wednesday, February 2nd. University Club. 7 p.m. Annual dinner.

(Scottish Centre, Students' Section).—Wednesday, February 2nd. Royal Technical College, Glasgow. 7.30 p.m. Discussion.

(North-Western Students' Section).—Tuesday, February 1st. Milton Hall, Manchester. 7.30 p.m. "Alternating-current Bridge Methods." Mr. F. W. Fryer.

(South-Midland Centre, Wireless Sub-Section).—Wednesday, February 2nd. University, Birmingham. 7 p.m. "Transatlantic Telephony." Lt.-Col. A. G. Lee.

Edinburgh Electrical Society.—Thursday, February 3rd. Royal Scottish Society of Art. 8 p.m. "Country Distribution." Mr. J. S. Thomson.

Diesel Engine Users' Association.—Friday, February 4th. Discussion on "Report on Heavy Oil Engine Working Costs for 1925-26."

Institution of Mechanical Engineers.—Friday, February 4th. London. 7 p.m. "Engineering Salesmanship." Mr. W. Reavell.

Royal Institution.—Friday, February 4th. "Wireless Transmission and the Upper Atmosphere." Prof. E. V. Appleton.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, February 5th. Annual dinner at Cox's Café, Cardiff.

Notes.

Lecture.

Professor Cramp, of the Electrical Engineering Department of the Birmingham University, who spoke on the subject of cheapening the domestic electricity supply in a mid-day address at the Birmingham Y.M.C.A. on January 19th, gave practical examples of supplying heat through floors for offices, and through stoves which received the heat during the night and gave it off during the day. The principle underlying this cheap supply was that the current must be on during certain hours only, and this was operated, in practice, by automatic switching arrangements. He suggested that consumers ought to ask to be allowed to take electricity for domestic purposes at a very low rate during those hours when the generators were not loaded up.

The Batti-Wallahs' Society.

The Society attains its 21st birthday this month, and the Committee hopes to make 1927 a notable year in celebration of the event. On Tuesday, February 1st, at the Engineers' Club, an informal supper and concert will be held. An additional item is that Past-president M. S. Chambers will emerge from retirement to crack the "Jokes in the Bayeux Embroidery." On Wednesday, February 16th, a luncheon will be held at the Hotel Cecil, when Sir Duncan Watson will address the members on "The Prospects of the Electrical Industry." On Tuesday, March 22nd, the annual dinner will be held at the Hotel Cecil, and this year it will include only one or two short speeches and will be followed by dancing till midnight.

Fatalities.

At the Philadelphia power station of the Newcastle-on-Tyne Electric Supply Co., Ltd., on January 15th, Wilfred Henry, an electrician's mate, received a fatal shock. According to the evidence at the inquest, Henry was testing lamps in the indicator box when one failed to light. It seemed as if he had attempted to remove the lamp and that one of his fingers had come in contact with a live terminal. There was a burn on the middle finger of the right hand. The current was at 250-V pressure. A doctor was of opinion that death was due to cardiac arrest caused by electricity passing through the man's body. A verdict of "Accidental death" was returned, and the company's representative promised to bring before the notice of the company a suggestion by the Electrical Inspector of Factories that when the box was being dealt with in future the current should be cut off.

A verdict of "Accidentally electrocuted" was returned at an inquest at Redcar on January 17th on John Joyce, who was killed at the works of Messrs. Dorman, Long & Co., Ltd. It was stated that the deceased was the driver of an electric crane which ran on the ground level and conveyed steel ends from one part of the mill to another, where they were picked up by an overhead crane. The driver of the overhead crane said that he left his machine to look for the electrician, as he was having trouble with the motor. In his absence Joyce got on to the top platform of the overhead crane, a position of great danger on account of the live wires which ran only about five feet above. He next saw Joyce hanging by both hands from a live wire; he must have closed the main switch to set the crane in motion. It was stated that it was no part of Joyce's duty to drive the overhead crane.

The death took place on January 11th, as the result of injuries received in a motor-cycle accident, of Mr. Norman Arthur Wallis, who was on the staff of Mr. Featherstone, electrical engineer, of Ashford, Kent.

The death occurred recently from injuries received in a motor-cycle accident of Mr. Maurice W. Billcliffe, aged 25 years, who was an assistant shift engineer at the Kingston-on-Thames Corporation electricity works.

Meter Engineers' Technical Association.

At the fifth general meeting of the above Association, held at the Lighting Service Bureau, London, on January 21st, Mr. W. Casson read the second part of his paper on "The Testing of Large-Capacity Meters *in situ*." An interesting discussion followed, in which the practice of *in situ* testing was generally approved.

The first annual dinner of the Association was held at the Engineers' Club, London, on January 22nd, when the chair was taken by Mr. G. F. Shotter, president of the Association. Some 90 members and visitors were seated. "The Meter Engineers' Technical Association" was proposed by Capt. J. M. Donaldson, M.C., M.I.E.E. (North Metropolitan Electric Power Supply Co.), who paid a tribute to the president for the work he had done for the North Metropolitan Co. By means of a rough estimate of the number of electricity meters installed throughout the country, he showed the great amount of work that was done in connection with their manufacture and maintenance. Many meters had been on circuit for over 20 years, and he did not believe they were O.K. He thought the time would come when all meters would be "taken off the wall" after a definite period. In Montreal, where he had spent some time on meter testing, no meter was installed for a period of longer than five years. It was asserted that too much was expected from the electricity meter; but they all expected their watches to be accurate within a minute per day. It was up to the Association to tell the manufacturers to buck up. Although he felt that an association of that sort was bound to come, he would like to see it affiliated with the Institution of Electrical Engineers, which would add to its strength.

Mr. Shotter, in reply, referred to the work that had been done by the hon. sec. of the Association, Mr. Geo. D. Malcolm, during the first stage of the career of the M.E.T.A. The total membership of the Association was now 134, including several members abroad. It was officially recognised by the British Electrical Standards Association, and had a member sitting on a committee of that body. He asked for the full co-operation of all members and the sympathy of the electricity supply authorities and the Press. Mr. E. W. Hill, hon. assistant secretary, proposed "The Visitors," and in a humorous speech referred to the formation of the Association and its work to date.

Mr. W. C. P. Tapper, M.I.E.E. (Stepney), said that it would be necessary to ask the B.E.S.A. soon to set up a committee to standardise associations. He paid a tribute to Mr. Malcolm for the excellent work he had done at Stepney in redesigning the test room. The meter work of a large undertaking was no light task. In referring to his work some years back at Brighton, on the old copper-sulphate meters, he thought it a good thing that there were only 400 instead of 4,000 of those meters.

Mr. P. W. Tucker (ELECTRICAL REVIEW) replied on behalf of the electrical Press wishing the Association success in the future. Mr. Knowles (Evershed & Vignoles) proposed "Absent Members." Items by specially-selected entertainers during the evening added to the enjoyment of the proceedings.

Electrical Association for Women.

A course of six evening lectures is being given at the Lighting Service Bureau, London, from January to April, which began on Wednesday, January 26th, with an opening lecture by Mr. J. W. Beauchamp, M.I.E.E., on the "History and Economics of Electricity Supply." On Tuesday, February 8th, Mr. W. E. Bush will deal with "Electric Light in the Home and in the School." On Friday, February 18th, household engineering and efficiency tests will be the subject, handled by Mrs. Christine Frederick (U.S.A.). On Wednesdays, March 9th and 23rd, simple household repairs, and electric power appliances in the home, will be discussed, and on April 6th, Mr. T. Settle (who has recently returned from America) will lecture on women's place in the American electrical industry. All the lectures will be of a practical nature, and are designed to help those women who are engaged in teaching or instructing other people regarding the uses of domestic electrical appliances.

A Kipling Society.

A society is being formed to study the works of Mr. Rudyard Kipling—"the most patriotic, virile, and imaginative of writers"—and has already gained enthusiastic support. Arrangements are in progress for holding the inaugural meeting. Particulars can be obtained from the hon. secretary *pro tem.*, "Kipling Society," The Milestone, Bath Road, Slough.

The Electricity Supply Rifle League.

The following are the results for the latter part of 1926:—Division 1: Central A, 580; County A, 578. County A, 573; St. James' 545. City A, 575; St. James', 535. City A, 576; County A, 573. Central A, 16 points; City A, 9 points; Shoreditch A, 7 points; County A, 6 points; St. James', 0 points.

Division 2: Shoreditch B, 539; Hackney, 534. Central B, 570; Hackney, 525. Central B, 564; County B, 545. B. and K., 572; Central B, 562. City B, 569; County B, 537. County B, 543; Shoreditch B, 540. B. & K., 573; Shoreditch B, 529. B. & K., 559; County B, 547. County B, 554; Hackney, 504. City B, 20 points; B. & K., 18 points; Central B, 16 points; County B, 8 points; Hackney, 2 points; Shoreditch B, 2 points; K. & K., 0 points.

The hon. secretary, Mr. E. Mathews, 18, Lower Clapton Road, E.5, would be glad to hear of clubs that would like to join in the tourney, in connection with the metropolitan electricity supply undertakings.

Educational.

EAST LONDON COLLEGE (UNIVERSITY OF LONDON).—A course of six lectures on "Short Electric Waves" treated experimentally—ranging from 200 metres down to 1 metre—will be given by Mr. J. H. Morrell, M.A., of the Electrical Laboratory, Oxford, on Mondays, at 6 p.m., commencing February 7th. The fee for the course is 10s. 6d.

Appointments Vacant.

Probationary assistant telegraph engineers, for the Governments of the Gold Coast and Nigeria; assistant electric car shed superintendent (£680), for the Buenos Aires Western Railway, Ltd.; meter fixer for Buxton Corporation Electricity Department. (See our advertisement pages to-day.)

Institution of Electrical Engineers.

FARADAY MEDAL.—The Council of the Institution has made the sixth award of the Faraday Medal to Prof. Elihu Thomson, of Boston, U.S.A., honorary member of the Institution, who is well known as one of the pioneers in the development of electrical engineering.

MEMBERSHIP.—The list of newly-elected members and transfers from one grade to another, which was adopted at the ordinary meeting of the Institution on January 20th, contained the names of no fewer than 497 candidates.

SOUTH-MIDLAND STUDENTS' SECTION.—Mr. G. L. E. Metz, presiding at a meeting last week, declared that the water-

power resources of this country, if fully developed, would be capable of a continuous output equal to approximately one-half the present total output throughout the country by steam stations. Water power could not, however, be considered a serious competitor of coal in the production of electricity at present, as the location of these water-power resources in the north and west was remote from any large industrial centres, and transmission costs, together with heavy capital charges upon storage lakes, &c., offset the advantages of having no fuel costs.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

SIR ANDREW RAE DUNCAN has been appointed to the post of Chairman of the Central Electricity Board. The Minister of Transport issued an official announcement to this effect on January 20th. Sir Andrew, who is 42 years of age, was born in Ayrshire, and after graduation at Glasgow University, he practised as a solicitor as a partner in a firm which specialised in industrial affairs (Biggart, Lumsden & Co.). In this capacity he gained a wide experience of the shipbuilding, engineering, and auxiliary industries. On the reorganisation of the Shipbuilding Employers' Federation and the removal of its headquarters to London, he became secretary of the Federation. He was appointed by Sir Joseph (now Lord) Maclay as secretary of the Merchant Shipbuilding Advisory Committee under the Shipping Controller during the war. In 1919 Mr. Lloyd George appointed Sir Andrew Coal Controller, and he relinquished that office at the end of 1920 on the formation of the present Mines Department. Since 1920 to the present time he has acted as vice-president of the Shipbuilding Employers' Federation. *The Times* states that he has directed the activities of that Federation with conspicuous success during the difficult years of the depression.

Elliott & Fry] [*London.*

Sir Andrew Rae Duncan,
The Chairman of the Electricity Board.

Among his other appointments, Sir Andrew Duncan has acted as Chairman of the Advisory Committee of the Coal Mines Department since 1920, Chairman of the Royal Commission to inquire into the coal industry in Nova Scotia, 1925, and Chairman of the Royal Commission to inquire into grievances of the Eastern Maritime Provinces of Canada, 1926. He recently returned from a three months' stay in Canada in connection with the last appointment. Sir Andrew has also acted as a member of the Royal Commission on National Health Insurance, of the Civil Service Arbitration Tribunal, and of courts of inquiry into labour disputes.

One newspaper report states that the remaining seven members of the board will be appointed before the reassembly of Parliament, which has been fixed for February 8th, and that the chairman will take up his duties as soon as his colleagues have been appointed.

MR. L. MACKINNON, who has been appointed to the position of general manager of the Glasgow Corporation Tramways, entered the service of the Corporation in 1887, so that he has completed 40 years' service. He was first employed in the City Cleansing Department, and in 1892, when Mr. Young was appointed first general manager to prepare for the taking over

Mr. L. Mackinnon,
General Manager, Glasgow Corporation Tramways.

of the city tramways by the Municipality on July 1st, 1894, he appointed Mr. Mackinnon as private clerk and secretary. He was therefore associated with the preparatory work and was successively manager's clerk, assistant traffic superintendent, chief of the purchasing and contracts department, traffic manager, and deputy general manager. Thus he has passed through many grades of the service, and has seen the transition from horse to electric traction and other developments. On many occasions during the absence of the former general manager (Mr. Dalrymple), he has had full control of the undertaking. Mr. Mackinnon was educated at the Glasgow High School and the Royal Technical College, Glasgow.

MR. D. POWELL, charge engineer at the Dover Corporation Electricity Works, has secured an appointment at the Wimbledon Electricity Works at £345 per annum.

The Hull Corporation Electricity Committee has recommended that the salary of Major BELL, the electrical engineer, be increased from £1,108 to £1,500.

MR. A. S. BLACKMAN, general manager and engineer of Sunderland Corporation Electricity Department, has gone on three months' leave of absence, with salary, granted him last year by the Council on his completion of 20 years' service with the Corporation and as a mark of appreciation of the able manner in which he has discharged duties connected with the large extensions of recent years.

MR. W. F. FERRIS received from his colleagues of the English Electric Co., Ltd., at Stafford, a gold watch and gold pencil at a dinner on January 14th. He will shortly be taking up duties for the company in Australia.

The German Elektrotechnische Verein has awarded to Dr. ADOLPH FRANKE, the president of the Siemens & Halske Gesellschaft, Berlin, the Siemens-Stephan Memorial Plate. This is the Union's highest award, and is granted every five years to the person who is considered to have rendered the greatest service to electrotechnical progress in general and to the Union in particular. Dr. Franke has been associated with the Siemens & Halske Co. for 40 years, and is known for his work in connection with high-frequency measurement apparatus for telephony and radio work.

MAJOR G. FETHERSTONE, D.S.O., M.C., has resigned his position as Trade Commissioner at Cape Town, with effect from the end of the current month, to take up a business appointment. Major Fetherstone has been at Cape Town for seven years, and was formerly at Sydney, N.S.W.

MR. J. E. KINGSBURY has changed his office address from Serjeant's Inn to 82, Victoria Street, Westminster, S.W.1. Telephone No.: "Victoria 1225."

The *Financial Times* records that Mr. GEORGE A. PIRELLI, who recently resigned his appointment as Italian Consul-General, has been elected Chairman of the Italian Chamber of Commerce in London.

MR. J. W. NEEDHAM, electrical engineer, has left Rosyth Dockyard to take up a similar post at H.M. Dockyard, Simonstown, South Africa. His successor at Rosyth is Mr. J. C. UGLOW, who has just returned from Gibraltar.

MR. HOWARD A. LEWIS, director and sales controller of Kelvinator of Canada, Ltd., and director of the Electrical Refrigeration Corporation, of Detroit, was to arrive from America on Friday last. He will remain in Europe for a few weeks dealing with matters connected with automatic electric refrigeration, and his address will be 30-35, Drury Lane, W.C.2.

The Dover Corporation has granted a month's leave of absence to the borough electrical engineer owing to illness.

MR. H. P. STOKES, manager and engineer of the Plymouth Corporation Tramways and Transport, is confined to bed as a result of a motor accident.

The marriage took place at Glasgow, on January 19th, of Mr. JOHN W. TORRANCE, partner in the firm of J. W. & R. Torrance, electrical engineers, of Hamilton, and Miss MARY BURNS GRANT.

It is proposed to advance the salary of Mr. F. A. BOND, the borough electrical engineer of Battersea, from £1,250 to £1,300.

Brighton Corporation Lighting Committee has promoted Mr. G. EVERETT, senior shift engineer, to be sub-station superintendent at North Road.

MR. R. A. MALLETT, M.C., sales manager to, and a director of, the Norman Electrical Co., Ltd., was married on 15th inst. at Chelsea to Miss GERALDINE GORDON.

The *South African Mining and Engineering Journal* reports that the Government of the Union of South Africa has made the following appointments to the Electricity Control Board:—Mr. H. PIRON (chairman), *vice* Sir Robert Klotze; Mr. C. MULLINS (Chief Inspector of Machinery), *vice* Mr. C. H. Hearn; and Mr. C. W. H. LANSDOWN (legal adviser), *vice* Mr. L. G. Nightingale.

Obituary.—MR. W. WATTS.—The death took place on January 15th, at the age of 72 years, of Mr. **Walter Watts**, who was for a number of years, until his retirement about three years ago, on the engineering staff of the Brighton Corporation Electricity Works at Southwick.

MR. G. L. SCOTT.—The death occurred on January 16th, at the age of 77 years, at Sevenoaks, of Mr. George L. Scott, who had been an Associate of the Institution of Electrical Engineers since the year 1901.

MR. A. W. BURCHARD.—The *Daily Mail* reports that Mr. Anson W. Burchard, chairman of the International General Electric Co., and a director of the British Thomson-Houston Co., Ltd., died recently from heart failure.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Electrical Refrigerators and Appliances, Ltd.—Private company. Registered in Edinburgh on January 15th. Capital, £3,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, manufacturers of and dealers in tramway, electrical, galvanic and other apparatus, &c. The first directors are:—F. T. Land, Coniston, Woodvale Avenue, Giffnock, Renfrewshire, nail and hardware merchant; T. A. C. Land, Mayfield, Bridge of Weir, Renfrewshire, nail and hardware merchant. Qualification, 100 shares. Secretary, T. A. C. Land. Registered office, 120, Bothwell Street, Glasgow.

Lockett, Lloyd & Statham, Ltd.—Private company. Registered January 15th. Capital, £2,000 in £1 shares. Objects: To acquire the business of electric light and power contractors, carried on by H. Lockett, J. B. Lloyd, and A. Statham, at Green Lane, Wilmslow, Cheshire, as Lockett and Lloyd. The permanent directors are:—H. Lockett, Beech Lane; J. B. Lloyd, Thornlea, Lacey Green; A. Statham, Macclesfield Road (all Wilmslow electric light and power contractors). Qualification of permanent directors, 500 shares; of other directors, 100 shares. Solicitors: Lingards, Sutton, Elliott & Co., 24, Fountain Street, Manchester. Registered office, Green Lane, Wilmslow, Cheshire.

W. L. Gray, Ltd. — Private company. Registered January 19th. Capital, £750 in £1 shares. To adopt an agreement with W. L. Gray and to carry on the business of electricians, manufacturers, generators, accumulators, and suppliers of electricity, &c. The first directors are:—W. L. Gray, 9, Victoria Parade, Muswell Hill, N.10, gentleman; Capt. H. J. Round, M.C., "Westfield," Colney Hatch Lane, N.10, engineer. Qualification, £20. Remuneration as fixed by the company. Secretary: E. Nicholas. Solicitors: Sewell, Edwards & Nevill, 35, Bucklersbury, E.C.4. Registered office: 9, Victoria Parade, Muswell Hill, N.10.

Wm. F. Thacker, Ltd.—Private company. Registered January 17th. Capital, £1,000 in £1 shares. Objects: To carry on the business of plumbers, electricians, electrical and radio engineers, &c. The directors are:—W. F. Thacker, "Govan," Manchester Road, Haslingden, sanitary and electrical engineer (permanent governing director and chairman); Mrs. E. A. Thacker, same address. Qualification, 10 shares. Solicitors: Evans & Cotton, Haslingden, Bacup and Rawtenstall. Registered office: 20, Blackburn Road, Haslingden.

Western Wireless and Electrical Co. (Salisbury), Ltd.—Private company. Registered January 19th. Capital, £1,500 in £1 shares. Objects: To acquire the business of a wireless and electrical engineer now carried on by A. G. Williams at 33, Fisherton Street, Salisbury, as the Western Wireless and Electrical Co. The permanent directors are:—A. G. Williams, 98, Fisherton Street, Salisbury; H. A. Dinnage, 33, Fisherton Street, Salisbury. Qualification, 100 shares. Solicitors: Trethowan & Vincent, Salisbury.

Hungerford and District Electricity Supply Co., Ltd.—Registered as a "public" company on January 21st. Capital, £10,500 (10,000 6 per cent. cumulative participating preference shares of £1 each and 10,000 ordinary shares of 1s. each). Objects:—To carry on at Hungerford (Berks.) and elsewhere the business of an electric power and supply company, to adopt an agreement with the Hungerford Electric Light and Power Co., and to acquire the business, undertaking, and rights belonging to that company. The minimum cash subscription is £7. The directors are:—S. W. Albright, J.P., High Street, Hungerford; H. Smith, 73, Fellows Road, N.W.3, electrical engineer; and C. L. de Wilde Reader, "The Elms," Orford, Suffolk, electrical engineer. Qualification, £100. Remuneration as fixed by the company. Solicitors: Ward & Melliar Smith, 35, Queen Victoria Street, E.C.4.

Official Returns of Electrical Companies.

Presteign Electric Co., Ltd.—Memorandum dated December 30th, 1926 (annexed to debenture dated September 25th, 1924), to secure £1,000 and also all sums paid by the guarantors on behalf of the company under a guarantee dated October 4th, 1926, charged on the company's undertaking and property, including uncalled capital. Holders: A. M. Wilson, The Moor, Presteign; and others.

Rhayader Electric Light and Power Co., Ltd.—Capital, £2,000 in £5 shares. Return dated November 4th, 1926. All shares taken up. £2,000 paid. Mortgages and charges, nil.

Radio (Hove), Ltd.—A. C. Gillman, of 103, Cannon Street, E.C.4, was appointed receiver and manager on January 6th, 1927, under powers contained in instrument dated October 2nd, 1925.

Leeds Radio Services, Ltd.—Capital, £2,500 in £1 shares. Return dated November 30th, 1926. 1,227 shares taken up. £1,227 paid. Mortgages and charges, nil.

Rangoon Electric Tramway and Supply Co., Ltd.—Satisfaction to the extent of £9,711, on June 3rd, 1926, of debenture stock dated February 1st, 1906, December 22nd, 1908, November 5th, 1913, and January 25th, 1924, securing £250,000. (Notice filed January 12th, 1927.)

E. Powell, Ltd.—Mortgage dated December 31st, 1926, to secure £1,225, charged on 39, High Street, Tunbridge Wells. Holders: W. C. Cripps and F. S. Harries, Tunbridge Wells.

Macintosh Cable Co., Ltd.—Satisfaction in full on December 31st, 1926, of debentures dated January 29th and March 19th, 1902, securing £6,500.

Dartnoor Electric Supply Co., Ltd.—Capital, £2,000 in 10s. shares. Return dated November 4th, 1926. All shares taken up. £2,000 paid. Mortgages and charges: £4,000 at 4½ per cent.; £3,950 at 6 per cent.; £3,550 held by bank as collateral security.

Weald Electricity Supply Co., Ltd.—Particulars filed of £100,000 debentures authorised December 15th, 1926, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £50,000.

C. J. Thursfield & Co., Ltd.—Mortgage debenture dated January 8th, 1927, to secure £1,000 charged on the company's undertaking and property, present and future. Holder: B. Park-Hughes, 173, Church Lane, Handsworth Wood.

Electrical and Chemical Ebonite Co., Ltd. — Particulars filed on January 12th, 1927, of £8,500 debentures authorised by resolutions of April 12th and May 17th, 1926, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Ilfracombe Electric Light and Power Co., Ltd.—Satisfaction in full on December 31st, 1926, of mortgage dated September 10th, 1924, securing £10,000.

Lewis, Thomas & Sons, Ltd.—Debenture dated January 5th, 1927, to secure £1,000, charged on the company's undertaking and property, including uncalled capital. Also mortgage of same date and collateral to the above debenture charged on certain land and premises in Tregaron, Cardigan. Holder: D. L. Doughton, Hengwm Clarach, Cardigan.

Teignmouth Electric Lighting Co., Ltd.—Debenture dated January 11th, 1927, to secure £12,500, constituting a specific mortgage and charge on freehold and leasehold properties at Teignmouth, Kingsteignton, Shaldon, and Bishopsteignton, and a floating charge on the remainder of the company's undertaking and property, present and future, including uncalled capital. Holder: H.M. Treasury Solicitor.

City Notes.

County of London Electric Supply Co., Ltd.

Meetings of holders of the company's first and second 4½ per cent. debenture stock are to be held on February 17th to consider proposals for the exchange of their holdings for Government securities. To the first debenture holders the company offers £115 of the new 4 per cent. Government Consolidated Loan in exchange for each £100 of 4½ per cent. debenture stock, and to the second debenture holders £112 10s. of the new 4 per cent. Government Consolidated Loan for each £100 of 4½ per cent. debenture stock. This offer will give the first debenture holders 2s. per cent. more than they are receiving at present, and the second debenture holders will receive the same rate of interest which they are now receiving (4½ per cent.), but it must be borne in mind that the first debenture stock is redeemable at £115, while the second debenture stock is redeemable at £105 (both at the company's option). The chief advantage of the offer arises, however, from the value of the new Government loan which, in both cases, considerably exceeds the present market value of the first and second debenture stock.

S. Smith & Sons (Motor Accessories), Ltd.

The annual meeting was held on January 20th. Mr. W. Henderson-Cleland, M.C. (chairman), who presided, said that the net profit for the past year was £73,336. The directors had decided to make an issue of 400,000 7½ per cent. cumulative preference shares of £1 each at par. With the proceeds it was intended to repay the company's indebtedness to the banks and other debenture holders, and cancel the debentures. The interest on borrowed money during the past year amounted to £30,500. Out of the profit £62,000 had been placed to reserve (making £140,000), and they proposed to pay a dividend of 7 per cent. on the preferred ordinary shares. The amount which stood to the credit of the reserve represented earnings on behalf of ordinary shareholders not distributed. As soon as circumstances permitted, the reserve would be distributed in cash or capitalised form between the two classes of ordinary shareholders. The company's position was sound, and the future prospects were good. The amount hitherto paid as debenture interest would be sufficient by itself to cover the dividend upon the new shares. The report and accounts were adopted, and at subsequent separate meetings the issue of the new preference shares was approved.

The prospectus was issued later. The shares will rank in priority to other classes for dividend, and for repayment in the event of a winding up. The dividend is cumulative.

Shanghai Electric Construction Co., Ltd.

The directors announce that although the profits of the past year fully warrant the payment of a second interim dividend of 4 per cent., they have decided to postpone payment in view of the unsettled state of Shanghai, which resulted in a suspension of tramway services on January 18th. The first interim dividend was 4 per cent., paid in October last.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159, and they have all been ordered to be officially quoted:—

American Telephone and Telegraph Co.—$10,483,900 capital stock.

Brompton and Kensington Electricity Supply Co., Ltd.—58,496 ordinary shares of £1 each fully paid, Nos. 292,301 to 350,796.

General Electric Co., Ltd.—111,670 ordinary shares of £1 each fully paid, Nos. 2,141,976 to 2,253,645.

Montreal Tramways Co.—$2,217,000 Series "B" 5 per cent. general and refunding mortgage sinking fund gold bonds, due April 1st, 1955, Nos. C1 to 310 ($100), D1 to 372 ($500), and M1 to 2,000 ($1,000).

Traction and Power Securities Co., Ltd.

The report for the past year shows a net revenue of £56,802, to which is added £28,748 brought forward, making £85,550. After paying interim dividends there remains a balance of £68,810. From this it is proposed to transfer £10,000 to reserve, to pay the final preference dividend, and one of 10 per cent. on the ordinary stock, making 14 per cent. for the year (as against 13 per cent.), leaving £29,771 to be carried forward. During the year there was issued a further £146,023 of 4½ per cent. debenture stock. It is proposed to change the title of the company to "Traction and General Investment Trust," and a resolution to effect this will be presented at the annual meeting on February 1st.

Companies Struck Off the Register.

The names of the undermentioned companies have been struck off the Register, and they are thereby dissolved:—

Bennetts (Electrical Engineers), Ltd.
Bloom's (Wireless), Ltd.
City of Wells and District Electricity Supply Co., Ltd.

Marconi's Wireless Telegraph Co., Ltd.

The directors announced last week that the report of the investigations carried out by the company's auditors and Sir Gilbert Garnsey had been presented to them. It is their intention to consider the report at once, and to call a meeting of shareholders at the earliest possible moment, to lay proposals before them.

Dublin United (Electric) Tramways Co., Ltd.

The directors recommend the payment of a dividend on the preference stock at the rate of 6 per cent. for the half-year ended December 31st, 1926, and a final dividend on the ordinary stock at the rate of 7 per cent. per annum (making 5½ per cent. for the year). They also propose to set aside £55,000 for renewal of track; £5,000 for overhead line, standards and cables; £3,500 for power-station plant, and to carry forward £15,188.

Shropshire, Worcestershire and Staffordshire Electric Power Co.

An extraordinary meeting is to be held on February 4th for the purpose of considering a resolution empowering the directors to issue the balance (250,000) of the company's "A" ordinary shares of £1 each.

Columbia Gas and Electric Corporation.

Quarterly dividends of $1.50 per share on the 6 per cent. preferred stock and of $1.25 per share on the no-par-value common stock have been declared.

Enfield Cable Works, Ltd.

An interim dividend of 5 per cent. actual has been declared on the ordinary shares, as in 1926.

Stocks and Shares.

MONDAY EVENING.

THE investment markets of the Stock Exchange have received a powerful stimulus from the success attendant upon the issue of the new 4 per cent. Consolidated Loan. Although subscriptions received allotments in full, the demand for the new stock has been so considerable as to cause the price to hold a useful premium. Stags have done well out of their speculation. The effect is highly advantageous to investment stocks and shares of all kinds. The Bank Rate is expected to be lowered in the Thursday of this week. It has stood at 5 per cent. since December 3rd, 1925. Such gilt-edged securities as London Power 5 per cent. debenture have now reached a price-level at which the return on money invested at to-day's quotations is barely 5 per cent. And the demand for stock continues to be insatiable, despite the expectation of increased taxation in the spring Budget. The gravity of the Chinese news imposed a halt upon undue exuberance.

Normally, the idea of a rise in income-tax serves to direct attention to those stocks and shares the dividends upon which are paid net. We could never quite see why this should be the case, but the fact remains, arguing lack of intelligence in the inquirer who wonders why. The Eastern quartette of cable companies pays the dividends, on its ordinary capital, free of tax. The average yield is now £5 13s. per cent., equi-

valent to a shade over 7 per cent. on the money, with a 4s. tax. There are not many well-secured ordinary shares which return as much as those in the Eastern group, and it is not unreasonable to look for a rise in their prices.

Oriental Telephone and River Plate Telephone shares are also in receipt of what is termed tax-free dividends. A gain of 1s. 6d., to 23s. 6d., has accrued to Venezuela Telephones. The preference strengthened to 24s. No assignable cause being offered for the advance, speculation occupied itself with shrewd guesses as to the likelihood of a resumption of negotiations for purchase of the company's undertaking. The last minute breaking-off of a similar arrangement some months back is still fresh in the memory of everyone interested. Curiosity awaits developments with lively attention. Telephone Manufacturing are easier at 7s. 10½d.

The Metropolitan Railway dividend announcement is due on Thursday in this week. A year ago the company paid 3 per cent., making 5 per cent. for 1925. Last July, however, the interim dividend of 1½ per cent. was 10s. per cent. less than that for the corresponding half-year. The District Railway also paid 1½ per cent. as an interim dividend last August, which was unchanged from the year before. The ordinary stocks of both companies have lost a point, and Underground £1 shares drooped to 13s. No serious hope is entertained of a dividend, yet, on the last-named, British Electric Traction stocks maintain their prices.

Bournemouth and Poole ordinary have been stirring again, and a little demand led to 1/16 rise, at 60s. 9d. The dividend declaration comes next month, but the present hardness is explained by references to renewed hopes of the undertaking being acquired by one or other (or both) of the Corporations named in the company's title. There may, however, be a sounder reason than this for the support rendered by purchasers of the shares. The Egham and Staines report is due shortly, and, on the basis of the 7½ per cent. dividend in each of the last three years, the shares yield £6 16s. 9d. at the present price of 22s. 3d. Sevenoaks Electric new ordinary shares are available at 21s. 3d. free of stamp and fee—which saves threepence per share—and have partial dividend falling due in June. The company paid annually 7 per cent. in 1925 and 1926; the current yield, at this rate, is £6 11s. 9d. per cent. Midland Counties ordinary, now at 21s. 3d., will have a full year's dividend to come in March; last year the company paid 6 per cent. Newcastle-upon-Tyne Electric ordinary are easier this week at 20s; there is some doubt as to whether, in view of last year's coal stoppage, the usual full 7 per cent. dividend can be expected in March. Llanelly ordinary received a 5 per cent. dividend for 1925. The price stands at 16s. 6d., at which a 5 per cent. dividend will give £6 1s. 3d. per cent. on the money. Shropshire Electrics are 1/16 up at 26s. 3d. on the decision of the board to issue 250,000 "A" ordinary shares. Edmundsons and Urbans both yield a shilling or two under 6 per cent. There is a little business doing in the ordinary shares of the Atlas Light and Power Company—the old Argentine Light and Power—and the price is 15s. 6d. middle.

Brussels has taken a violent fancy again to Brazilian Tractions, and, with Montreal also a supporter, the price rose 6 to 118. The advance has been consistent since the board notified its intention to oppose amalgamation in any form with certain other concerns. The preferred are strong at 108. Other Brazilian tramway issues are a good market, on the view that Brazil may be able to re-institute her sinking-fund in the early future.

London electricity supply shares are steady, but uninteresting. No change of any consequence has occurred in the price-list. Of the debenture stocks, South Londons are 1 higher at 97. The appointment of Sir Andrew Rae Duncan as Chairman of the Central Electricity Board has been received with favour. Sir Andrew was at one time Coal Controller, and subsequently had a good deal of experience in connection with coal-mining matters. Shanghai Electrics fell ⅛ to 38s. 9d. because of the present trouble in China. Shareholders in electric supply companies will observe with quiet attention that the Gas Light and Coke Company has reduced its dividend to £5 0s. 8d. per cent., against £5 2s. in the previous year.

Marconis touched 17s., to react to 15s. upon the announcement that the long-expected report is about to be handed to the sub-committee appointed to consider it.

Mexican utility issues remain dull, the Light and Power preferred, with a gain of 1, being the only shares in the group to show firmness. The U.S. Secretary of State at Washington has stated his belief that arbitration should be employed for the settlement of the dispute between America and Mexico. Amongst "dollar" stocks, Montreal Light has risen 4 points to 74½. Shawinigans are down to 277½. The Traction and Power Securities Company has decided to change its name to the Traction and General Investment Trust. The dividend of 14 per cent. on the ordinary stock is 1 per cent. higher than that of a year ago.

The Enfield Cable Works has announced an interim dividend of 5 per cent., the same as before, and the price of the shares is unchanged. British Aluminium shares are dull. Telegraph Constructions have gone up to 29½. The manufacturing group is quiet, but attracts a fair amount of business. Rubber shares move within narrow limits. Engineering and the iron-coal division are disposed to harden, by reason of the cheery business outlook foreshadowed by various authorities in their recent speeches.

Share List of Electrical Companies.

	Nom.	Dividend. 1924.	Dividend. 1925.	Price Jan. 24 1927.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	£1	14	14	60/9	+1/3	4 12
Brompton Ordinary	£1	10	10	25/-	—	5 12 0
Charing Cross Ordinary	£1	15	15	25/-	—	5 12 0
do. do. 4½ Pref.	£1	4½	4½	17/6	—	5 2 10
Chelsea	£1	12	12	25/-	—	5 12 0
City of London	£1	15	15	2½	—	... ...
do. do. 6% Pref.	£1	6	6	23/-	—	5 4 4
Clyde Valley	£1	8	8	28/6	—	5 12 4
County of London	£1	15	15	27/6	—	... ...
do. do. 6% Pref.	£1	6	6	23/-	+6d.	5 4 4
Edmundson's Ordinary	£1	7	8	26/9	—	5 19 8
do. 7% Pref.	£1	6	7	23/-	—	6 1 9
Elec. Supply Corporation	£1	10	10	30/6	—	6 11 2
Kensington Ordinary	£1	15	15	24/-	—	5 16 8
Lancs. Light and Power	£1	7½	7½	24/-	—	6 2 5
London Electric	£1	10	10	24/-	—	5 17 8
do. do. 6% Pref.	£1	6	6	23	—	5 11 7
Metropolitan	£1	11	11	26/-	—	5 7 8
do. 4½% Pref.	£1	4½	4½	17/-	—	5 2 10
Midland Counties	£1	6½	6	21/-	—	5 14 8
Newcastle-on-Tyne Ordinary	£1	7	7	20/-	—½	7 0 0
do. 5% Pref.	£1	5	5	17/6	—	5 14 3
do. 7% Pref.	£1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	£10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref.	£1	6	6	23/-	—	5 9 1
St. James' and Pall Mall	£5	17½	17½	24/-	—	5 16 8
South London	£1	15	15	24/6	—	6 3 0
South Metropolitan Pref.	£1	7	7	1½	—	6 3 0
Urban Ordinary	£1	4	7	1⅛	—	5 17 11
do. 6% Pref.	£1	6	6	20/6	—	5 17 1
Westminster Ordinary	£1	15	15	24/6	—	5 14 3
Whitehall Elec. Invst. 7½% Pref.	£1	7½	7½	29/3	—	7 8 2
Yorkshire Elec.	£1	8	8	27/6	+6d.	5 16 5
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	70	—	5 14 4
Metropolitan	£5	5	5	64	—1	7 16 4
do. District	£5	5½	5½	57	—1	6 2 10
Underground Electric	£1	Nil	Nil	13/-	—6d.	Nil
do. do. Income	Bonds	6	6	104	—	*5 15 8
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	101½	—	5 18 3
do. Def.	£5	1½	1½	25½	+¼	5 18 10
Automatic Telephone	£1	8	10	9½	—	8 12 9
Chili Telephone	£5	5	6	6½	—	4 12 4
Cuba Sub. Ord.	£10	5	5	7	—	7 5 6
Eastern Extension	£10	10	10	17⅝	—	*5 13 4
Eastern Tel. Ord.	Stock	10	10	174½	—	*5 14 7
Globe Tel. and T. Ord.	£10	10	10	18½	—	*5 6 8
do. do. Pref.	£10	6	6	11	—	5 9 1
Great Northern Tel.	£10	22	20	27	—	7 8 2
Indo-European	£5	9½	10	47½	—	*5 5 10
Marconi	£1	10	Nil	15/9	—1/-	... ...
Marconi-Marine	£1	10	7½	1⅛	—⅛	6 6 4
Oriental Telephone Ord.	£1	12	12	2⅞	—	*4 18 4
United R. Plate Tel.	£5	8	8	8½	—	*4 15 6
Western Telegraph	£10	10	10	17	—½	*5 17 8
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref.	£5	5½	5½	2½	—⅛	9 15 6
do. do. 2nd Pref.	£5	6	6	2½	—	10 8 8
do. do. 5% Deb.	Stock	5	5	70½	+2	7 1 10
British Electric Traction Ord.	£1	7	8	144½	—	5 10 9
do. do. 6% Pref.	£1	6	6	109	—	5 10 1
Brazil Traction	£100	4	5	118	+6	4 4 9
Brit. Columbia Elec. Ry. Pcc.	Stock	5	5	89½	+2	5 11 9
do. do. Preferred	£1	90/-	126/9	121½	—	*5 3 11
do. do. Deferred	£1	120/5	8	152½	+1	*5 4 11
do. do. Deb.	£1	4½	4½	80½	+1	5 5 7
London & Sub. Trac. 5% Pref.	£1	2½	Nil	7/-	—	Nil
London United Tram. Deb.	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds	—	5	5	64	—½	7 12 0
Mexican Light Common	£100	Nil	Nil	82½	—	Nil
do. Pref.	£100	Nil	Nil	77½	+1	Nil
do. 1st Bonds	—	5	5	63½	—	7 17 6
Yorkshire (West Riding)	£1	5	—	12/6	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	£1	12	13	58/9	—	4 16 8
British Aluminium Ord.	£1	5	10	48/9	—9d.	4 2 0
British Elec. Transformer Pref.	£1	Nil	7	18/8	—	7 18 5
British Insulated Ord.	£1	15	15	70/-	—	4 5 9
Brush Ord.	£1	10	10	26/9	—	7 9 4
Callenders	£1	15	15	8½	—	4 5 9
do. 6½% Pref.	£1	6½	6½	23/9	—	5 9 5
Crompton Ord.	£1	Nil	Nil	10/-	—	... ...
Edison-Swan	£1	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	84	—	5 19 1
Electric Construction	£1	10	10	81/3	—	6 8 0
Enfield Cable Pref.	£1	7½	7½	1½	—	6 6 4
English Electric	£1	5	Nil	15/-	—	... ...
do. do. Pref.	£1	6	6	17/6	—	6 17 2
Gen. Elec. Pref.	£1	6½	6½	23/6	—	5 10 8
do. Ord.	£1	5	7½	31/6	—	4 15 3
Henley	£1	16	20	4¾	—	4 11 4
do. 4½% Pref.	£5	4½	4½	4½	—	5 6 0
India-Rubber	£1	5	5	1	—	*5 0 0
Johnson & Phillips	£1	10	17½	2½	—	5 19 1
Met.-Vickers Ord.	£1	8	8	36/9	—	5 19 8
do. Pref.	£1	8	8	2⅞	—	6 18 4
Siemens Ord.	£1	7½	7½	1¾	—	4 16 0
Telegraph Construction	£5	20	10	29½	+½	*4 0 8

*Dividends paid free of Income Tax.

Britain's Foreign Electrical Trade.

Statistics and Comparisons.

HAVING received the Board of Trade returns for December last, we are now in a position to review the course of foreign electrical trade during the whole of 1926. Dealing first with the December figures, we note that although the export total was lower than in the preceding month, it was above that for the last month of 1925. As compared with November, there was a fairly general decrease; only four items rose in value, but these increases were more than counterbalanced by several large falls in other classes. The machinery section was about £90,000 down, and insulated wires and cables were also considerably lower in value. In comparison with December, 1925, the position was altered; the increases predominated, and there were only two notable decreases, one of which was in the case of submarine cables—that ever-varying item.

Imports were slightly higher than in November, although the decreases were equal in number to the increases. The most notable rise was in unenumerated electrical machinery (over £57,000), while batteries and accumulators showed the greatest decline. In the main, the comparison with December, 1925, shows similar results, but although unenumerated machinery was again the leading item so far as increases were concerned, batteries and accumulators recorded a substantial rise, and the greatest fall was in telegraph and telephone apparatus.

In both comparisons, re-exports for December showed increases, the outstanding items being rises in unenumerated goods and apparatus and telegraph and telephone apparatus.

Electrical Exports and Imports during December, 1926.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Dec., 1926.	Inc. or dec. as compared with Nov., 1926.	Inc. or dec. as compared with Dec., 1925.	Electrical imports for Dec., 1926.	Inc. or dec. as compared with Nov., 1926.	Inc. or dec. as compared with Dec., 1925.	Electrical re-exports for Dec., 1926.	Inc. or dec. as compared with Nov., 1926.	Inc. or dec. as compared with Dec., 1925.
Electrical goods and apparatus (unenumerated)	£190,030	− £2,160	+ £33,554	£122,666	− £2,643	− £8,159	£9,932	+ £3,360	+ £4,290
Insulated wires and cables ...	295 608	− 41,938	+ 42,194	56,518	− 1,135	− 17,641	469	− 80	− 192
Glow lamps	46,713	− 14,109	+ 6,424	41,856	− 3,479	+ 4,915	1,165	− 634	+ 740
Arc lamps and parts	725	+ 61	− 278	3,803	+ 2,535	+ 2,285	6	+ 3	− 6
Batteries and accumulators ...	104,527	+ 10,055	+ 29,390	67,178	− 34,835	+ 16,650	2,400	+ 1,978	+ 1,856
Meters and instruments ...	27,534	− 9,226	− 694	25,928	+ 6,036	+ 3,161	162	− 197	− 1,537
Carbons...	3,034	+ 1,328	+ 1,914	11,491	+ 1,800	+ 2,229	17	+ 1	− 437
Electrical Machinery—									
Electrical machinery (unenumerated)	259,556	− 28,278	− 41,479	145,790	+ 57,782	+ 43,484	7,698	+ 555	− 107
Railway and tramway motors	49,288	− 20,499	+ 3,538	—	—	—	—	—	—
Other motors and generators	202,847	− 34,069	+ 5,214	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	7,387	− 256	− 1,713	800	+ 477	+ 575	—	—	− 30
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	73,802	+ 12,052	+ 11,008	11 871	+ 1,078	− 2,691	8	− 32	− 56
Submarine telegraph and telephone cable...	13,717	− 3,333	− 44,520	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	259,629	− 60,453	+ 42,433	52,968	− 12,635	− 17,968	7,130	+ 3,474	+ 1,718
Totals	£1,534,397	− £190,824	+ £86,985	£510,869	+ £14,991	+ £26,837	£28,987	+ £8,428	+ £6,239

Turning to the annual statistics, it will be observed that there was a definite improvement last year as compared with 1925. Exports rose in value by £636,764, while imports fell by £422,743. Thus the trade balance in our favour (ignoring re-exports) rose from £12,010,216 to £13,069,723—over £1,000,000.

In the export section, cables were responsible for the largest alterations. Insulated wires and cables increased in value by £681,148, while submarine telegraph and telephone cables declined by £771,715. Apart from these, the two most important changes were increases of £295,325 in telegraph and telephone apparatus and £220,410 in unenumerated electrical goods. The decreases, with the exception of submarine cables and railway and tramway motors (£58,141), were all of very small proportions.

With regard to imports, the outstanding feature of the year was a fall of £345,857 in the case of telegraph and telephone apparatus; this overshadowed the other decreases, although some of these were of substantial proportions (*e.g.* glow lamps £91,209). There were only two notable increases, the greater occurring in the case of unenumerated electrical machinery (£68,222).

The re-export list shows decreases mainly and a resultant fall of £24,804 in the total. As in the case of imports, unenumerated machinery showed the greatest rise, and telegraph and telephone apparatus the greatest fall.

Radio apparatus is not shown separately in our figures, but this was dealt with at length in a recent issue of the *Wireless Trader*. Our contemporary's figures show that there was a slight decrease in 1926 as compared with the previous year in the exports of radio apparatus and valves. The totals for the two years were respectively £1,266,384 and £1,289,749, a fall of £23,365. Re-exports were also lower, the value being given as £35,263, as against £45,338.

The curves which accompany these notes require little explanation. The first illustrates the course of our electrical exports during the years 1925 and 1926. In the former year the monthly fluctuations were not very

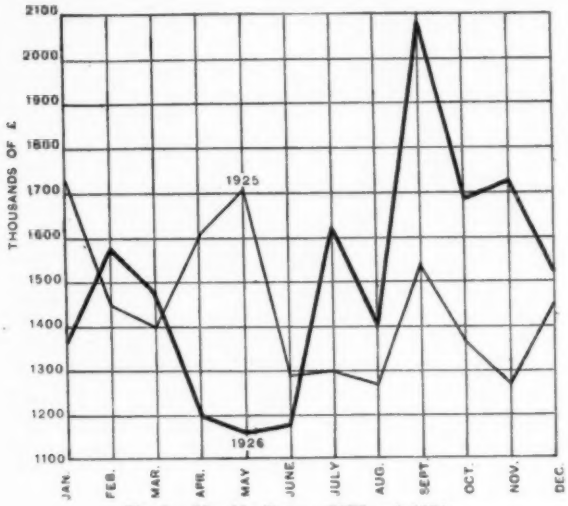


Fig. 1.—Monthly Exports 1925 and 1926.

great and the peak was reached in May. This month is usually a good one from the export point of view. In 1926, the variations were violent ones, and on account

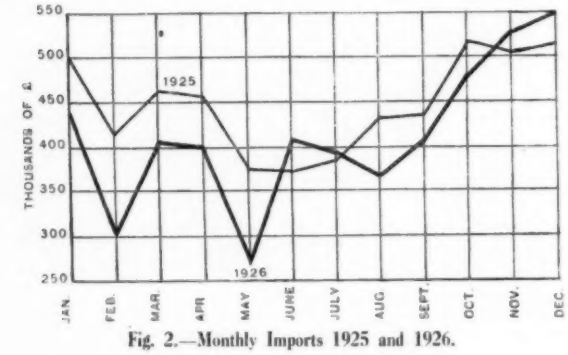


Fig. 2.—Monthly Imports 1925 and 1926.

of the general strike May was the poorest month. It is noteworthy, however, that in eight months out of the twelve, the 1926 figures were above those of the corresponding figures for the previous year. The import curves (fig. 2) reveal the reverse; for eight months the 1926 imports were below those for the corresponding months of 1925. With the exception of the large fall in May last year, and the reaction in June, the two curves are very similar. Fig. 3 deals with three leading export items; for convenience, the term "insulated wires and cables," has been made to include non-submarine telegraph and telephone cables. Submarine cables exhibit too abnormal fluctuations to be included in the figures. In two of the curves, the general strike period is very apparent; but in the case of unenu-

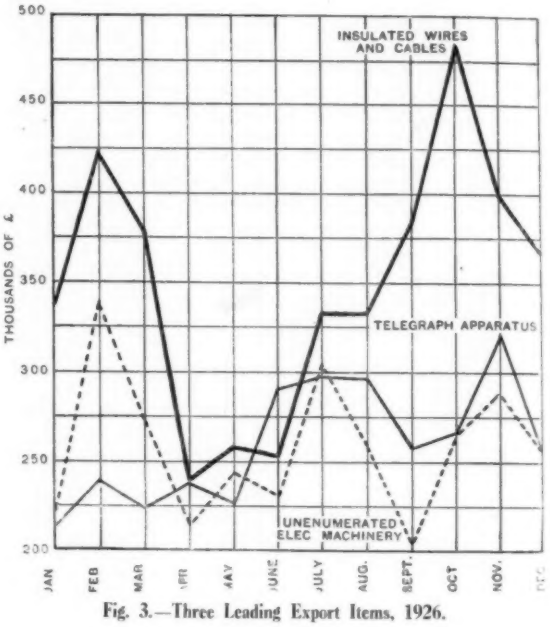


Fig. 3.—Three Leading Export Items, 1926.

merated electrical machinery, a slight improvement occurred in May, and the lowest level was reached in September. Insulated wires and cables, after falling a little from the May figure, rose rapidly up to October, but there was a rather sudden fall in the last two months of the year. The general level of telegraph and telephone apparatus exports was higher during the latter half of the year, the peak being reached in November.

Electrical Exports and Imports during 1925 and 1926.

	Exports.			Imports.			Re-exports.		
	Electrical exports, 1925.	Electrical exports, 1926.	Inc. or dec. in 1926 as compared with 1925.	Electrical imports, 1925.	Electrical imports, 1926.	Inc. or dec. in 1926 as compared with 1925.	Electrical re-exports 1925.	Electrical re-exports 1926.	Inc. or dec. in 1926 as compared with 1925.
Electrical goods and apparatus (unenumerated) ...	£1,825,255	£2,045,665	+£220,410	£1,186,731	£1,212,094	+ £25,363	£87,392	£73 395	—£13,997
Insulated wires and cables	2,665,445	3,346,593	+ 681,148	611,357	598,129	— 13,228	16, 87	15,117	— 1,070
Glow lamps	510,841	50 ,758	— 10,073	426.231	335,022	— 9 ,209	8 310	12,270	+ 3,960
Arc lamps and parts ...	16,312	9,611	— 6,678	16,025	21,457	+ 5,112	2,137	1,838	— 299
Batteries and accumulators	973,252	1,0 4.473	+ 41,221	637,860	652.718	+ 14 858	12.510	12,348	— 162
Meters and instruments ...	365,843	388,781	+ 22,938	270,468	219 389	— 51,079	11,351	7,994	— 3,357
Carbons	23,417	18,306	— 5,111	101,536	93,559	— 7,977	2,306	1,416	— 890
Electrical Machinery—									
Electrical machinery (unenumerated)	3,061,520	3,100,399	+ 38,879	1,084,559	1,152,781	+ 68,222	66,838	81,749	+ 14,911
Railway & tramway motors	545,632	487,491	— 58,141	—	—	—	—	—	—
Other motors and generators	2,155,179	2,229,180	+ 74,001	—	—	—	—	—	—
Switchboards (not telegraph or telephone) ...	88,155	84,782	— 3,373	1,784	2,127	+ 343	1,408	68	— 1,340
Telegraph and Telephone Cable and Material.—									
Telegraph and telephone wires and cable (not submarine)	705,357	823,290	+ 117,933	186,483	151,866	— 34,617	8,371	4,425	— 3,946
Submarine telegraph and telephone cable	1,601,401	829,686	— 771,715	—	7,006	+ 7,006	—	—	—
Telegraph and telephone instruments and apparatus...	2,831,331	3,126,6 6	+ 295,325	835,680	489,823	— 345,857	70,706	52,092	— 18,614
Totals	£17 368 930	£18,005,694	+ £636,764	£5,358,714	£4,935,971	— £422,713	£287,516	£262,712	—£21 804

Fig. 4 exhibits companion curves to those in fig. 3, upon the same scale, showing two further important export items. The heading "motors and generators," includes railway and tramway motors. The curve for these reached its lowest point in June, but made a rapid recovery, and after a slight set-back, continued upward until November, after which it fell to about the January level. The exports of unenumerated electrical goods showed smaller variations, and reached their nadir

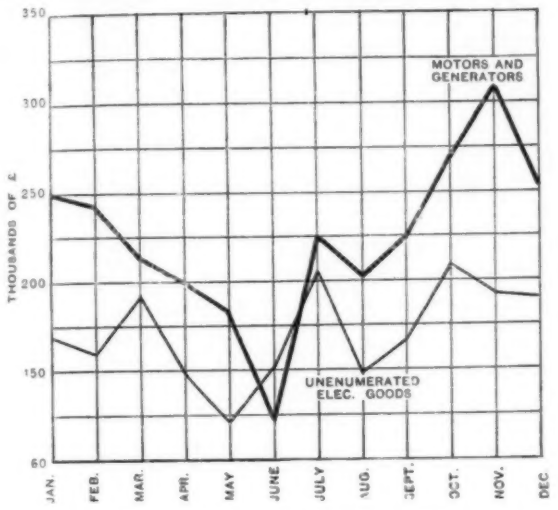


Fig. 4.—Two Leading Export Items, 1926.

in May. The last set of curves (fig. 5) deals with the leading classes of imports, and here again the term "insulated wires and cables" includes non-submarine telegraph and telephone cables. All three curves reached low levels in May, but that showing unenumerated electrical machinery fell lower at two periods of the

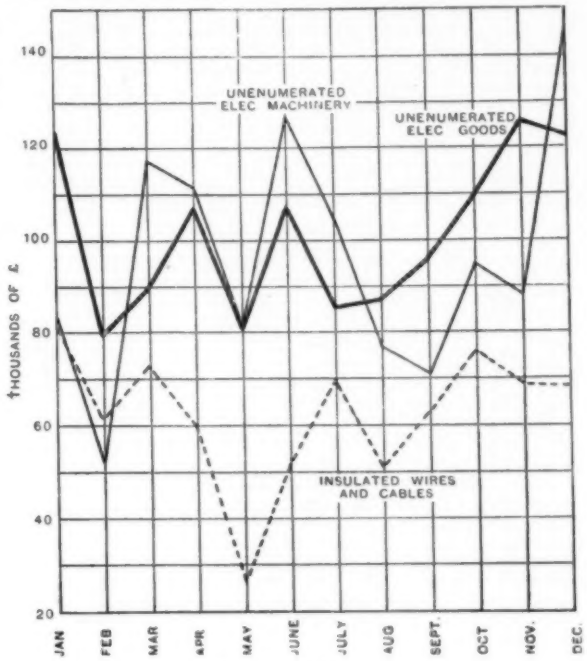


Fig. 5.—Three Principal Classes of Imports.

year. In all cases there was a swift recovery from the effects of the general strike, followed by a reaction and a further rise.

The Physical Society's Exhibition.

Annual Display of Electrical Instruments and Scientific Apparatus.

(*Continued from page* 110.)

George Kent, Ltd.

Although not definitely electrical, the Kent rotary steam meter will appeal to power engineers, being of novel design. It consists of a fan which is driven round by steam passing through a shunt circuit, the speed of the fan being kept low by a damping chamber. The drive is taken out through a magnetic gland to a counter which reads direct in pounds of steam. The materials of which this meter is made are carefully chosen so as to withstand the corrosive action of steam, and we understand that meters of this pattern have been in use for 12 months without any loss of accuracy; they are essentially suitable for small mains.

Crompton & Co., Ltd.

The "Alltest" instrument, which was exhibited for the first time last January, has had improvements made to it, and the S.M.S. pattern hygrometer has been modified also; it depends for its action on the weight of a hygroscopic body attached to a gravity movement which operates a pointer that moves across the scale, which is calibrated to read from 0 to 100 per cent. humidity. The housing consists of a standard 6-in. dial instrument case, except that gauze sides are provided to allow of the easy entry of the outside atmosphere, which is, of course, essential to the correct reading of the indicator. An entirely new and improved pattern of single-phase, dynamometer type indicating wattmeter, wound for a current of 5 amperes and for any pressure range up to 150 volts, was shown for the first time. The current range, of course, can be extended in the usual way by means of current transformers, and the pressure range by means of external resistances.

The National Physical Laboratory has carefully tested these instruments, and a most satisfying report indicates that the instruments are absolutely independent of change of frequency or power factor. In addition, standard laboratory and test-room apparatus was shown.

Mullard Wireless Service Co., Ltd.

A complete series of "PM" receiving valves was on view; also low-impedance rectifiers for battery eliminators; high-power valves, including the metal-glass and silica types; and the Holweck molecular pump. Amongst the miscellaneous items was a selection of wire-wound anode resistances and grid leaks, and a piece of resistance wire carrying a continuous current of 8 mA. A short-wave oscillator was on view, employing two Mullard DO/40 valves, oscillating on a wavelength of 2.5 metres under working conditions. Two inductances were used, consisting of simple loops of wire joining in one case the anodes of the two valves, and in the other case the two grids; the mid-point of the anode loop was connected to the high-voltage supply, and the mid-point of the grid loop was connected through the grid-leak to the filament. The high-voltage supply was approximately 500 volts, obtained direct from a transformer. The oscillatory current was indicated by a single-turn loop of copper wire forming a circle of 6 in. diameter and including a condenser consisting of two copper plates 5 in. × 3 in. and about ⅛ in. apart; a small pea lamp in this circuit was kept glowing by the oscillatory circuit. Visitors were able to observe the electron emission of a "PM" filament: a test board was so arranged that, on pressing a push button, the electrical circuits for heating the filament and measuring the total emission were completed; it was thus possible to observe the large emission from these very dull-filament valves. The company also showed one of its low-power rectifiers (the DU/10) working on a resistive load from the alternating-current mains at a voltage of 200, which was transformed to 4 volts for heating the filament; a d.c. output of about 70 mA at 70 volts was obtained, and the total input was roughly 12 watts, less than the power consumed by one average electric lamp connected to the domestic mains, the output being sufficient for running an average 3- or 4-valve receiver.

M.O. Valve Co., Ltd.

This exhibit showed considerable advances in technique and general design of the thermionic valves which the company manufactures. New patterns have been described in our pages recently, one of the latest being illustrated elsewhere in this issue, and finished products were to be seen on the stands of the company's selling agents. The displays embraced practically every type of valve, transmitting, receiving, and rectifying, which is marketed under the Marconi and "Osram" names, as well as some experimental types probably destined to be included in the wide range at a later date. Manufacturing apparatus and machines were shown; also various valves designed specially for operation at high frequencies, and a low-frequency oscillator was seen operating at approximately one cycle per second, showing cyclic variation of oscillatory current, &c.

Nalder Bros. & Thompson, Ltd.

The well-known "N.C.S." and "Ideal" electrical measuring instruments and protective relays were on view, including flame-proof instruments suitable for use in fiery mines; also rotary synchroscopes, circuit breakers, the "Ohmer" insulation testing set, current and potential transformers, and the Turner efficiency indicator, which is a combination of venturi meter and wattmeter for ascertaining the performance of steam turbo-alternators. We hope to say more about the company's latest developments in a later issue.

Dubilier Condenser Co. (1925), Ltd.

This large display included a variety of types of radio condensers and resistances. For smoothing in conjunction with thermionic-valve rectifiers, condensers of considerable capacity are required, capable of withstanding high d.c. voltages; they are fitted with safety spark-gap and discharging resistance to dissipate the energy of the discharge, and are supplied in two main types, the smaller being fitted in wax-filled wooden boxes, while the larger types are in oil-filled steel tanks. The latter type is also employed when the smaller units are required for operating in tropical climates. The "Duwatcon" variable condenser is specially constructed to overcome the gap in the tuning range which exists when an ordinary type is used in the aerial circuit as a series-parallel condenser. The "Ducon" is a device which enables the electric lighting wires of flats, &c., to be used with safety for the reception of broadcast and other signals. The "Duvolcon" unit employs the same type of resistance as the "Duvarileak," but is intended for use as the means of controlling the volume of sound from a loud-speaker, or, alternatively, as a means of controlling reaction in a radio receiver. The "Dubrescon" protects the valves of a receiving set from destruction by accidental contact with the h.p. pins of the valve-holder or wrong connections, and a simple wavemeter for general experimental work utilises a neon lamp as resonance indicator, thus eliminating the risk of burning out the indicating lamp by excessive coupling to the oscillation circuit.

A compact arrangement of condensers in a metal box for eliminating radio interference due to sparking on dynamos, motors, &c., should be useful, while the "Hiloten" apparatus for supplying all the current required to operate a radio-receiver by direct connection to ordinary electric lighting mains is made in two models: one for use on d.c. and the other on a.c. circuits; this apparatus provides 6 volts with current up to 1.5 amps. and two or more h.p. voltages, one at least of which is continuously adjustable.

Siemens Bros. & Co., Ltd.

The Company's exhibits included a drum-type temperature recorder, which consists of a millivoltmeter calibrated as a temperature indicator, and recording mechanism driven by clockwork. The indicating pointer is fitted with a stylus near its outer end, which swings beneath a chopper bar that is depressed every minute, thus causing the pointer stylus to press down on the chart paper, and the successive dots, lying close together, give a graphical record of the temperature variations. With this arrangement the pointer swings perfectly freely, and there are, therefore, no errors due to friction. The recorder may be calibrated for use with either distance thermometers or thermo-electric pyrometers.

The temperature indicators shown were all of the moving-coil type, with a high internal resistance, so that variations in the resistance of the thermo-couples and connecting leads have little effect on their readings. They may be divided into two classes, namely, precision indicators and base-metal indicators. Often several thermometers or pyrometers are used in conjunction with a single indicator, and in such cases the indicators are combined with selector switches, which are of the press-button type, arranged in a circle; any thermometer or pyrometer may be instantly connected to the indicator by pressing the corresponding button. In the case of thermometer outfits, each selector switch has, in addition, one press-button marked "test," which is required for periodically testing the battery voltage; the necessary battery is contained in the switch case. A simple potentiometer for measuring the e.m.f. of thermo-couples has the following advantages:—It is substantially made and carefully calibrated; there is no mirror galvanometer, and therefore all readings can be taken in broad daylight. It can be easily and rapidly adjusted, and has five ranges, the change from one to the other being made by a simple movement of a lever switch; the accuracy of the apparatus is high, and the ammeter and indicator may be easily and rapidly checked against one another and against a standard cell; resistance of the thermo-couple and its leads does not affect the results when the "null method" is used.

Everett, Edgcumbe & Co., Ltd.

A wide range of electrical measuring instruments was, as usual, exhibited by this firm. Of the "Omni-Range" portable-current transformer a "precision" model is now available. The ratio and phase curves, fig. 16, for such a transformer, as designed for use with sub-standard wattmeters, &c., indicate that the change of ratio from rated current down to one-tenth of rated current is less than 0.1 per cent., and the phase displacement only about 2 minutes; even with a burden of as much as 20 volt-amperes, the ratio error does not exceed 0.2 per cent., or the phase displacement 7 minutes at any point within the range; such figures are believed to be unique. A 44-kilovolt bar-type current transformer was exhibited for a full-load current of only 120 amperes, in which the ratio error was no more than ½ per cent. and the phase displacement less than 90 minutes at any current down to one-tenth of full load. A current transformer having characteristics such as these enables power measurements to be made with accuracy, and yet has all the advantages of the straight-through construction.

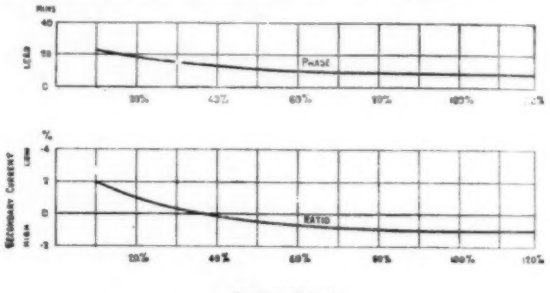


Fig. 16.—Phase & Ratio Curves of Portable Current Transformer.

The phase sequence indicator shown measured only 3 in. across, and consisted of a miniature three-phase motor provided with a rotating disk, which carries an arrow-head showing the order of phase sequence according to its direction of rotation; three spring jaws have merely to be clipped on to the three points to be investigated, and it can at once be seen whether the voltages are coming up in the right order. The windings on these instruments are such that they can be used on any voltage likely to be met with in practice, and those who have endeavoured to check the connections of a two- or three-element wattmeter, or of a power-factor meter, without the help of such an instrument will recognise how useful it will be.

A very compact testing set was exhibited which, although embodying two instruments only, enables a.c. current, voltage, and power to be measured. When a knob marked "amps" is depressed, the pointer indicates the amperes passing; when another knob marked "volts" is depressed, the pointer indicates the voltage between the terminals, and the wattmeter readings are independent of the position of the "volts" and "amps" press switch. These sets are available for single-, two-, and three-phase measurements at any frequency, and measure only 14 in. × 10 in. × 6 in.

Adam Hilger, Ltd.

In addition to optical devices, apparatus for X-ray crystallography and spectrography was exhibited, and also piezo-electric quartz oscillators for controlling radio-transmitters. The demonstration apparatus comprised an oscillating circuit with mounted crystal attached by flexible leads and an auxiliary generator, both of which were tuned to nearly the same frequency (6,666 kilo-cycles per second); the two circuits were loosely coupled together, and the difference in frequency gave rise to the beat note heard.

Weston Electrical Instrument Co., Ltd.

Dynamometer-type laboratory standard instruments with an accuracy of at least 1/10 of 1 per cent. either in d.c. or a.c. circuits of any frequency up to 133 cycles per second form very valuable transfer instruments from d.c. to a.c., and permit a.c. readings to be taken with a great degree of accuracy. Other items included fan-shaped d.c. switchboard instruments and regular type round and sector patterns; also a group of rectangular instruments for a.c. switchboards: the reduced space occupied is the principal feature of this design, and the pleasing appearance and bold scale are noteworthy features.

A new radio panel voltmeter 2 in. in diameter for use upon receiving sets is supplied in single and double ranges of exceptional sensitivity for such small instruments, namely, 125 ohms per volt; they are of the permanent-magnet pivoted

moving-coil construction. A new radio voltmeter, known as the "Pin Jack" and high-range stand are designed so that a radio panel may be fitted with jacks which are connected permanently to the filament terminals; the voltmeter can then be plugged into the pin jacks to measure the voltage at the filament terminals, the instrument having a range of 6 volts and a sensitivity of 125 ohms per volt. By plugging the instrument into the high-grade stand provided, an additional range of 200 volts is obtained for the measurement of anode voltage.

Stonebridge Electrical Co., Ltd.

Besides such items as universal precision instruments, multi-range current transformers and recording power-factor meters (all portable), electrostatic voltmeters for pressures up to 400,000 V are marketed for continuous insulation check, and are frequently combined with an electrical distance indicator on the main switchboard.

An electrical distance indicator and recorder of angular displacement, which is independent of supply pressure variations, has a continuous scale, and employs no step resistances, is suitable as an indicator of the position of turbine valves, discharge and throttle valves, switches, automatic discharge apparatus, water sluices, for indicating fluid level and flow, radio goniometers, &c. Movement is transmitted through suitable gearing to a small spindle projecting from the case of the transmitter; in the latter the magnetic field of a moving coil produces an e.m.f. which influences the position of the moving-coil system in the receiver instrument definitely and continuously, and by suitable regulation of the field current, angles smaller than 90 deg. can be amplified on the indicating instrument to the full available scale angle of 90 deg. For angular displacements of more than 90 deg. reduction gearing (spur, or worm wheels) are inserted between the coupling spindle of the transmitter and the object the angular displacement of which is to be measured, in order to reduce the latter on the transmitter to 90 deg.

Creed & Co., Ltd.

Besides the Murray multiplex printer for Government telegraph and Press service, the Company had a direct printer (start-stop system) on view, which should be of interest to large engineering and other concerns in that it offers, it is claimed, more efficient service than the telephone for intercommunication purposes. It is suitable for the direct communication of telegrams between large business houses and the nearest head telegraph office, thus effecting great economy in time, and it is also suitable for communication between offices and works, or between distant departments. The direct printer has advantages over the telephone, some of which are: A printed record is made of each message at both the transmitting and receiving ends of the line; in the case of transmitted figures, confusion cannot arise between fives and nines, &c. Messages are automatically received on the machines, and remain there until they can receive attention. Telephone messages often arrive when the person at the receiving end is in the middle of other important work, leading to delay, confusion, forgotten messages, or illegible writing, if the message is recorded hurriedly by hand. The printer can be installed in the noisiest workshops, where telephone messages could not be heard, and the apparatus is also ideal for railway telegraphy, and is soon to be installed for one of the largest British railways, we understand.

M-L Magneto Syndicate, Ltd.

Portable peak-voltage measuring devices were shown designed for use particularly when peak values take the form of impulses of relatively short duration, as compared with the time intervals which separate them. Under such conditions the energy available at the moment of occurrence of the impulse is usually small, and it is important that the capacity and energy consumption of the measuring apparatus shall be reduced to a minimum, so as to avoid disturbing the characteristics of the circuit to which it is connected. Two forms of apparatus were exhibited: one suitable for impulsive peaks up to 300 volts, the other for from 2,000 to 15,000 volts. Both forms employ in the first instance a two-electrode rectifying valve and a small condenser charged through the valve to the maximum voltage occurring in the circuit to which it is connected, and the voltage across the condenser is then measured in the first type of apparatus by sharing the charge of the small condenser with a larger one, which controls the grid potential of a three-electrode valve. Measurement of the current in the plate circuit with a definite plate potential gives the grid potential, and hence the potential to which the condenser has been charged. In the second type of apparatus the condenser is shunted by a calibrated spark gap between two brass balls 20 mm. in diameter; one of the balls is fixed, the other adjustable through the medium of a cam fixed on a shaft, which also carries a graduated dial; by suitably shaping the cam, even calibration of the dial is obtained. Each type of apparatus is mounted in a wooden case about 9 in. cube, which also contains the accumulator for heating the filament, and in the first type of apparatus a small motor generator for supplying the plate current.

(To be continued.)

High-Voltage "S.L."-Type Cables.

33,000-Volt Cables with Metal-sheathed Cores, each of which is Separately Lead-covered.

By P. DUNSHEATH, O.B.E., M.A., B.Sc., M.I.E.E.

(Abstract of paper read before the INSTITUTION OF ELECTRICAL ENGINEERS.*)*

DURING the past few years the use of 3-core cables for voltages higher than about 22,000 has introduced new and uncertain factors into the field of underground electric transmission; 33,000-volt cables have caused a good deal of anxiety to cable manufacturers and cable users, and the failures which have occurred have involved both sides in financial loss, besides introducing too frequent interference with the continuity of supply on large systems.

The outstanding feature of the breakdowns is the long period which elapses after the cables have been brought into use before failure occurs; the majority of the failures occur during times of light load on the cables. Various explanations have been advanced, but the most probable one seems to be closely associated, though not identical, with that which was first advanced by Hochstädter and supported by more recent investigators. Hochstädter attributed the failures to tangential electrical stresses in the outer layers of the core dielectric; impregnated paper has a higher electric strength in a direction perpendicular to the surface than along the surface, and this would seem to justify the tangential-stress theory, which, however, is not quite sufficient to explain what occurs. It is a common experience, for instance, in examining a piece of cable which has failed under the conditions stated, to find a large proportion of the length still in perfect condition, with no sign of deterioration, although the tangential stresses, on the theory named, must be the same throughout.

If we supplement the tangential-stress theory by considerations of the ionisation of air, or other gas, in a space within the dielectric under stress, then we approach more nearly to an explanation which will cover the recorded phenomena. In other words, if the dielectric is subjected to tangential stresses at a point where the space which should be filled with oil contains air instead, then an electrical discharge may occur over the surface of the paper which will result in the slow destruction of the paper fibres and ultimate total failure of the cable.

The presence of spaces devoid of insulating compound between the cores of a 3-core cable may be accounted for by one or more of the following reasons:—(1) Faulty mechanical construction; (2) imperfect impregnation; (3) distortion and separation of the cores by mechanical stresses during laying; and (4) separation of the cores by thermal expansion during heating under load.

Several suggestions have been made for the design of a 3-core cable in which this destructive action could be pre-

vented. In 1914 Hochstädter took out a patent for covering the individual cores with a tightly-adhering conducting film, so as to level up the distribution of potential in the direction of the layers; later he protected the manufacture of a perforated metallised paper for use as the conducting film, and many cables have been made in which the impregnation has been carried out after the application of this type of coating.

In comparing the relative merits of plain 3-core cables and those with metal-sheathed cores for use at a working pressure of 33,000 volts, it must be admitted that, as regards reliability in operation, the metal-sheathed type has many advantages and practically no disadvantages. The advantages may be summarised as follows:—

(1) The long-time failures experienced on plain 3-core cables have been found to originate in core-to-core faults, not between core and earth; the metal-sheathed-core cable has a larger core-to-core thickness for a given diameter of cable than the plain 3-core type.

(2) The presence of the metal sheath prevents direct core-to-core faults, and in case of failure from any cause the breakdown takes place to earth, which is an advantage from the operation point of view; the fault current can be limited by earth resistance in the neutral.

(3) The electric stress is uniformly radial in all parts of the dielectric and consequently normal to the surface of the paper.

(4) The whole of the dielectric subjected to stress is homogeneous; there are no wormings or packings in the electric field.

(5) Separation of the cores by mechanical distortion of the cable, or by thermal expansion, cannot introduce voids into the dielectric under stress; should the cores become separated from one another by a small fraction of an inch from any cause whatever, the conducting sheath moves with the core, and the space that is formed is outside the field and out of contact with the dielectric.

(6) The metal sheaths facilitate the carrying of the heat away from the centre of the cable, which is the hottest and, therefore, the most dangerous part.

The only practical disadvantage that can be advanced against the metal-sheathed-core cable is that it has a slightly higher inductive capacity than the plain 3-core type. On modern systems, however, this is not a serious point, as the charging current on no-load helps to neutralise the magnetising current of large connected transformers, and on load the leading current is soon lost in connected plant with lagging power factor.

(1) In the S.L. type large-diameter lead tubes are avoided: in view of the plastic nature of lead and the necessity for bending, this results in a better mechanical construction; for a given overall diameter of cable, a given amount of bending results in less distortion of the lead sheaths in the S.L. type than in the other forms of metal-sheathed-core cables.

(2) Owing to the greater mass of metal surrounding the individual cores, the cooling effect and consequently the current-carrying capacity is greater for the S.L. type than for the others.

(3) For use in hilly country, where there may be a considerable head of oil in the cable, the S.L. type with its small-diameter lead sheaths and absence of worming spaces filled with oil has obvious advantages; the whole of the oil inside the lead sheath of the S.L. type of cable, being in contact with the laminated dielectric, is less liable to flow than when it is not so supported as in the non-S.L. type.

(4) The S.L. type makes possible the use of longitudinal steel reinforcing strands, or pilot cables, in the scores between the cores and outside the dielectric.

(5) The S.L. type permits of freer impregnation; each core is impregnated separately, instead of all three cores with their wormings being treated together as in the non-S.L. type.

To illustrate the mechanical advantages of the S.L. cable, a length with the section shown in fig. 1 passed unharmed through a bending test that would have ruined a non-S.L. cable of the same overall diameter. The standard B.E.S.A. test is 6 turns round a barrel 12 times the diameter of the cable, but the S.L. cable was bent the standard number of times backwards and forwards on a barrel only 9 times its own diameter, and the resulting distortion was negligible; a length of plain 3-core, 33-kV cable subjected to the same test suffered considerably. The S.L. type was then subjected to tensile tests, and on a 7-yard length, the three cores being gripped at one end and the three strands at the other, a pull of 1½ tons was required to withdraw the strands. In another test the reinforcing strands were gripped at both ends, the cores being left free, and a pull of 4 tons applied for 15 minutes; the cores did not suffer in any way, showing no sign of corrugation or distortion.

A disadvantage claimed against the S.L. type of cable is the presence of undesirable currents in the lead sheaths, owing to their enclosing the separate conductors and being cut by the rotating magnetic flux. The sheaths may be insulated from one another, in which case it is sometimes

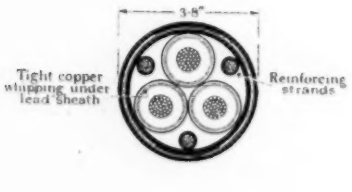


Fig. 1.—SL Steel-Tape-Armoured Cable with Reinforcing Strands.

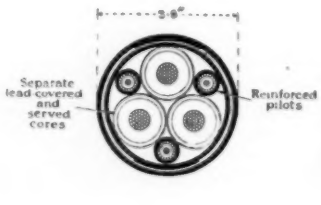


Fig. 2.—SL Steel-Tape-Armoured Cable with Armoured Pilots.

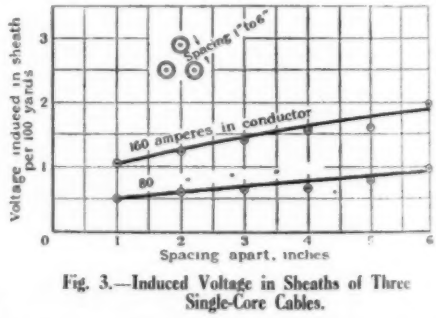


Fig. 3.—Induced Voltage in Sheaths of Three Single-Core Cables.

The various types of metal-sheathed-core cables can be divided into (*a*) cables with a common lead sheath over the assembled cores which are laid up before the impregnation process is carried out, and (*b*) cables in which the individual cores are dried, impregnated and lead-covered before being laid up; this type has no enclosing lead sheath over the assembled cores. The claims of the second type of cable (the S.L. type) for use on 33,000-volt systems were first advanced by the author in a discussion before the Institution three years ago, and since that date he has carried out extensive experiments to resolve certain questions of supreme importance in deciding on the suitability of this type for general use.

Figs. 1 and 2 illustrate two designs of S.L. cable. In the former, three separately lead-covered cores are laid up together with packings to a circular formation for taking the two coats of steel-tape armour with beddings and servings. In order to give the cable longitudinal strength while retaining the maximum flexibility, three steel reinforcing strands are laid up in the spaces between the cores as shown. In the second design, shown in fig. 2, advantage has been taken of the opportunity which this construction affords of housing pilot cores under the one common armouring with the main cores and inside the reinforcing strands. Another feature of importance illustrated in the first figure is the employment of a tight whipping of copper tape over the core papers immediately under the lead. This provides mechanical support to the papers, strengthening the cores and keeping them circular without depending on any restraining effect of the lead tube.

Briefly the relative merits of S.L. and non-S.L. metal-sheathed-core cables can be studied by stating the advantages and disadvantages of the first over those of the second: stated that dangerous voltages may exist between them, resulting in sparking across and pitting of the lead. If they are bonded together, the circulating currents cause loss of energy and by their heating effect reduce the current-carrying capacity of the cable. It is shown that the voltages generated are very small, that they can be suppressed by bonding the three sheaths together at the ends, that when the sheaths are bonded in this way the sheath losses are negligible, and that the presence of the separate sheaths, instead of increasing the temperature-rise and cutting down the current-carrying capacity of the cable, has the opposite effect to a very marked extent.

In the first investigation three lengths of single-core lead-covered cable were laid parallel to one another on a wooden floor supported by wooden blocks in triangular formation at various distances apart up to 6 in. The induced voltages observed between two lead sheaths at the near end with the far ends bonded for various distances apart are plotted in fig. 3. It will be seen from the actual measured voltage in the sheaths that if three such cables were laid up closely to form a 3-core cable of the S.L. type and the sheaths left unbonded, except at one end, the voltage generated in the individual sheaths would have a value not more than 0.5 volt per 100 yards for every 100 amperes flowing in the main conductor. For 100 amperes in the main conductor the total sheath loss would be about 20 watts per 100 yards; expressed as a percentage of the copper loss, this amounts to about 3 per cent. (*To be concluded.*)

Discussion in London.

Mr. C. J. BEAVER initiated the debate by referring to the causes of cable breakdown, remarking that the tangential stress itself was within the factor of safety of the dielectric, the real

danger being the presence of air in the cable. The author had described methods of construction, not manufacture; the "English thing" to have done would have been the examination of methods of preventing the occlusion of gas, his main point being that whatever risks were associated with cables at the lower voltages were increased as the dielectric was increased in thickness. Another way of attacking the problem, which was not new, however, was to pass the sheets of paper individually through the impregnating machine and then cut them up and apply them to the cable in the treated form: each piece and every part of the paper was thereby subjected to the same treatment, and that method allowed of the use of the most suitable compound for impregnation. The next inquiry was how to apply the paper to the cable so as to exclude air? They did that by submerging the whole cable in a bath of impregnating compound while the insulation was being applied: that was an efficient method, and the constituency of the liquid determined the separation of the layers of paper. He laid stress on the dielectric properties because the author had not mentioned them. Economic considerations influenced matters considerably, and the exercise of care was accordingly needed so as not to allow oneself to be carried away by comparisons.

Major A. M. TAYLOR thought figs. 8, 9, and 10 were particularly instructive. From fig. 8 with direct current the temperature of the copper conductor was only 37 deg. C. at 300 amperes, and with a 50-cycle alternating current it was 30 deg. C. at the same current. The mean sheath temperature, however, was 31 deg., as against 28½ deg. with d.c., a rise of 2½ deg., possibly due to the eddy-current losses in the lead sheathing. He suggested that there was a discrepancy between figs. 8 and 9 which indicated that one must only regard those temperatures as rough approximations. On the other hand, the results in fig. 10 which gave a conductor temperature of 50 deg. C. at the same current as before, and a sheath temperature of 23 deg. C., were a most eloquent testimony to the better dissipation of the heat from the copper in the "S.L." cable, as compared with that of an ordinary plain 3-core cable. For an equal conductor temperature of 35 deg. the relative carrying capacities were: plain 3-core cables 227 amps., "H" type 240 amps., "S.L." type 263 amps., from which, according to Dunsheath's experiments, the "H"-type cable had an advantage in current-carrying capacity of 6 per cent. The author's conclusions as regarded the greater dissipative capacity of the "S.L." cables would appear to be warranted by fig. 11, which showed that the "S.L." cable passed 16 per cent. more current (34½ per cent. more heat) than the plain 3-core cable, and 9½ per cent. more current (20 per cent. more heat) than the "H"-type cable. From which it would appear that the heat dissipative capacity of the Henley cable was no less than 34 per cent. in excess of that of the plain 3-core cable. The author had not done full justice to the single-core cable, because he had not put the two lead sheaths in immediate contact; his losses were far in excess of those that would actually occur, deduced from Prof. W. Cramp's formula. However, taking his figures, he made out an advantage of 6 to 8 per cent. on the cost in favour of the "S.L." cable. The speaker believed that it was possible to obtain 25 per cent. more current-carrying capacity out of single-core cables than the author had assumed, which would turn the balance the other way. The employment of 66,000-volt single-core cables at Paris and Newcastle appeared to be quite satisfactory.

Mr. S. W. MELSOM thought the paper a difficult one to discuss. It might be divided under three headings: conjecture, theory, and experiment. They had had enough of the first already, except that the author had hardly pointed out all the factors which influenced cable failures. Tests on cables immersed in water would not indicate the results obtainable when they were buried in soil. How far was the increased current-carrying capacity due to the "intersheath" and how far to difference in dimensions? That was a point on which figures were required. With regard to sheath losses, he agreed with the author's remarks.

Mr. T. N. RILEY expressed surprise that the author had referred to thermal and mechanical characteristics only, and not to electrical ones, for electrical tests were the only ones which revealed the true conditions. Initially perfect impregnation did not settle the matter, as it did not obviate the effects of expansion and contraction on cooling. He differed violently from the author's comparison of "S.L." and "H" type cables: when laying-up 3 cores they underwent very severe handling, and the steel-tape armouring which held the 3 cores together bore on one point of each only, so that it was not a good mechanical arrangement. He agreed that better cooling resulted, but it was only 2 per cent., which figure was within the experimental error margin. In hilly country, "SL" cable would have no real support against hydraulic pressure, since again only 3-point support was provided. Although the arithmetic might be simple, there was considerable controversy as to which was the correct method of calculation. Major Taylor's sympathy, he hoped, would not take too practical a form, because there were two ways of making high-voltage cable: one was to make it precisely similar to 11,000-volt cable, and hope for the best, while the other involved spending some money on research in the factory before commencing to manufacture.

Mr J. K. WEBB referred to sheath circuit losses and Prof. W. Cramp's analysis of the subject. The fierce integral in the author's formula could not be solved, but Prof. Cramp had worked out an example for the worst case, and he found that if the figure "3" were substituted for it the result would be adequate. The divergence between the author's and Dr. Cramp's formulæ was important.

Mr. F. C. RAPHAEL said that he had finished reading the paper strongly in favour of it; the author had done much to reassure them. With regard to longitudinal sheath currents, however, if a fault occurred at one end of the cable would it not be just possible for the cable to be stripped for some length?

Mr. E. BOWDEN thought it a great step forward to have heard it admitted that all was not well with high-voltage cables. Now that they were coming out into the open England might regain her leading position as a cable manufacturer. Impregnation did not present any real difficulty; if any were experienced, it could be got over. If the cores did separate when heated under load, that occurrence could never be avoided altogether; the facts of distortion by mechanical stresses during laying, and the separation of the cores by thermal expansion must be faced. The remedy was to let them distort, and therefore to keep the cores apart: most problems were solved by experience. He had a natural prejudice against internal pilot wires, as it was obviously desirable that the protective devices should be kept as far away as possible from the cables they were intended to safeguard.

Mr. A. RUSHTON was of the opinion that the sheath losses in "SL" cable were low because of the presence of the copper whipping under the lead sheath (figs. 1 and 2). He compared heating curves, drawing attention to a 2 or 3 deg. difference of temperature, and asked whether it might be due to test errors.

The PRESIDENT (Dr. W. H. Eccles), on account of the lateness of the hour, asked others who had intended to speak to send their contributions to the discussion in writing for publication in the I.E.E. *Journal*, and then called upon the author to reply.

Mr. P. DUNSHEATH, remarking that he must be brief, said that all agreed, of course, that the less air was permitted to remain in a cable the better; but when stresses were discussed, he disagreed with most speakers. Who knew what the stresses in a 3-core cable really were? No one knew. The copper tape was applied for certain reasons, but it did not affect the losses. Concerning Mr. Raphael's question, if an "SL" cable failed under large out-of-balance conditions, the same conditions would prevail as those experienced in Paris, and they had had no trouble there. The sheath current was very small in comparison with the conductor current. He agreed that if the figure "3" could be substituted as suggested in the formula, it would be a step forward. Regarding the accusation of indulgence in conjecture, the paper showed that he had supported most of his statements by facts.

Magnetic Testing of Wire Rope.

In a publication issued by the U.S.A. Bureau of Standards, Technologic Papers, No. 315, April, 1926 (10 cents), some details are given of the research work which has been carried out by the Bureau on the testing of wire hoisting rope by magnetic analysis. The investigation has been of a fundamental nature, consisting of a study of the magnetic properties of steel wire of the kind used in the manufacture of wire rope, and the effect on them of deterioration due to various causes, such as stress, wear, and fatigue. The work did not result in the development of a magnetic device for testing purposes, although much experimental apparatus was used. Certain definite results were obtained, however, which have an important bearing on the subject.

The Electrodeposition of Rubber.

Last year, Dr. S. E. Sheppard, of the Eastman laboratories, published the first announcement of his success in the electrodeposition of rubber. On October 28th there was formed at Akron the American Anode, Inc., by the B. F. Goodrich Co., the Eastman Kodak Co., and Anode Rubber Company, Ltd., of Great Britain, for the purpose of manufacturing rubber articles in America under processes patented by Dr. Paul Klein, of Budapest, and Dr. S. E. Sheppard and Dr. L. W. Eberlin, of the Eastman laboratories. The processes involve methods of compounding, milling and vulcanising rubber.

"Under the new processes," one expert said, "the principle involved is the deposition of rubber on the anode of an electric circuit, the anode serving as a mould or form. Methods of suspending compounded ingredients in the latex electrolytic solution also have been perfected and patented, as well as means for maintaining a constant concentration of the mixture."

It now is possible actually to rubber-plate moulds of any shape with rubber of tissue-paper thinness to several inches thick, Goodrich experts say. Arrangements already are being made with insulated wire makers to use the new process in insulating electric wires more speedily and with a far stronger coating.

Rubber bands no thicker than a thread have been manufactured under the new process, and have been found to be so much stronger than ordinary bands as to defy breaking by the bare hand. Other articles, such as thin tobacco pouches, gloves, and hot water bottles, similarly have been found to possess far greater strength and resiliency.—*Science*.

According to *Nature* of January 22nd, it is understood that the Dunlop Rubber Co. has acquired the British rights.

A Large Electrical Export Organisation.

The General Electric Co.'s Facilities and System.

OCCUPYING as it does a leading position among exporters of electrical merchandise, the General Electric Co., Ltd., has built up a very efficient organisation for dealing with the shipping of goods to overseas destinations. In the early days of the company, although the export business was not large, the special arrangements which were necessary led the company to place that branch of its activities in the hands of a special staff. This in itself increased export business, for customers found that their

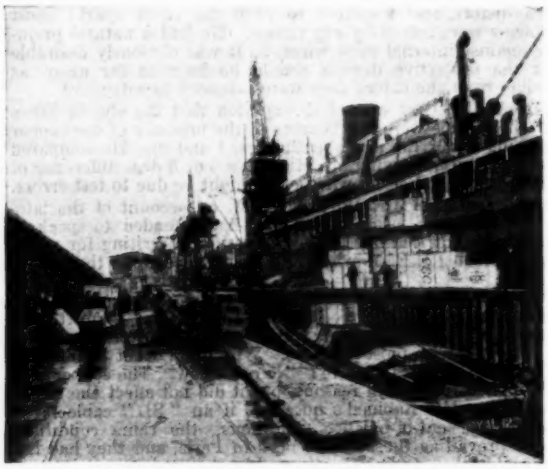


Fig. 1.—A Large Shipment of G.E.C. Products.

orders were attended to with accuracy and dispatch. Another aid to such business was the circulation of the Company's complete bound catalogue, which was soon recognised as the electrical buyers' *vade mecum*. In the course of a few years the overseas trade has reached gigantic proportions; a concrete example of this development is depicted in fig. 1, which shows a recent shipment to Australia by the steamer *Jervis Bay*. This comprised no fewer than 646 packages destined for various cities of the Commonwealth. Fig. 2 shows the large export depôt at Magnet Wharf, Silvertown, which is most conveniently situated for the dispatch of goods to any of the London docks. Spacious as this depôt is,

Fig. 2.—The Magnet Wharf Export Depôt.

however, it can only deal with a small proportion of the goods exported from the G.E.C. factories, and large shipments are sent daily straight from the works to outgoing steamers. Recently 150 tons of mining machinery for Canada was thus shipped from Liverpool in one lot. This was part of an order for two electric winders (2,450 and 1,400 h.p.), which was obtained in the face of American competition.

Magnet Wharf has every facility for handling large shipments. It possesses a convenient frontage on the Thames and a large railway siding, and is in a position to handle traffic between British ports. Every consignment from the depôt to the docks is accompanied by a special representative with experience in handling the goods, which ensures their arrival in first-class condition.

The Electrical Contractors' Association.

Annual Dinner.

ON January 18th, the Electrical Contractors' Association (Inc.), the N.E.C.T.A., Ltd., and the National Federated Electrical Association, held their annual dinner at the Trocadero, W. There were about 240 members and guests, including many leaders of the electrical industry, and Mr. H. J. Miles (president) occupied the chair.

Col. WILFRID ASHLEY, Minister of Transport, was the principal guest, and in proposing the toast of "The Allied Associations and Honorary Officials," which he professed not to comprehend, he said that during the past two years he had enough of electricity. Now, happily, the Electricity (Supply) Act had been passed and he was sure that it would be considered an excellent measure. Whatever they thought of it they should endeavour to make the best of it, as good citizens, for it was the law. He was very glad that the contractors and municipalities had arrived at an agreement with regard to the sale of fittings, &c. A continuance of the dispute would have led to nothing. After all, their differences were not really so great as was supposed; the main object of both parties was to serve the public. The agreed clause was fair alike to contractors, municipal authorities and consumers. The Government had not rushed into the Electricity Bill without great consideration. The question of reorganisation of the electricity supply industry had already been studied and reported upon by previous committees, but the Government appointed a further businesslike committee to deal with the matter, and that committee's findings, with one important exception, had been adopted practically as they stood. The Act was not a Party measure, as had been proved by the opposition to it of some of the Government's own supporters. The Government was satisfied that the Central Electricity Board, when functioning, would do much for the industry. He had received many letters offering the writers' services to the Government; one gentleman's qualifications were the successful organisation of Scout jamborees. He hoped to announce the names of the chairman and the board shortly. Apart from the generation of electricity, however, merchandising, propaganda and selling had to be improved, for they were of equal, if not greater, importance. The electrical industry had still something to learn from the gas industry, which knew how to push its wares very successfully. If the new Act cheapened electricity and the contractors did their part in development, we would soon be able to look the whole world in the face. Electricity should not be a rarity but a commonplace in the home. In conclusion, Col. Ashley referred with approval to the work which was being carried out by the Electrical Association for Women.

Mr. H. J. MILES responded to the toast and said that although the Association had done important work in the past quarter of a century, there was much more important work ahead. Contractors had found that union was strength, and so had other branches of the electrical industry. It had been the endeavour of the E.C.A. to bring all these branches together in order to discuss problems which affected them all. The conferences which had led to the formulation of the "agreed clause" had done a great deal to further that object. The agreed clause was not the only outcome of the conferences; they had also brought about a feeling of co-operation and goodwill which did not exist before. Mr. J. Y. Fletcher had said that the E.C.A. had raised its status in the eyes of all branches of the industry, especially the I.M.E.A. From being a business conducted separately by individuals, electrical contracting had grown to be a national industry, and their Association had to face that altered state of affairs. They realised that their prosperity was bound up with that of other sections of the industry and that they could not play a solitary part. They stood at the dawn of a new electrical era, and, he hoped, a new industrial era. Prosperity could only be attained by negotiation, compromise and goodwill. While the speaker agreed that wiring costs had to be reduced, he said that it was of no use providing a full installation, however cheaply, if the price of energy was not such as to enable the consumer to use it. So long as the present competition among contractors prevailed, the public had no cause for fear, but they must be upon their guard against shoddiness. He hoped that the Commissioners would be able to afford a little time to deal with that question. He believed that all responsible contractors would welcome compulsory wiring regulations. At present, however, the E.C.A. could not pin its members down to the I.E.E. Rules while others were allowed to do as they liked. A good and safe installation need not be more costly, however. He thought that supply engineers would find it difficult to reconcile the cost of hiring schemes with a low energy cost. Such schemes should be confined to the larger appliances and the smaller houses, and should only be run on a paying basis. It had been asked why the Association had not a membership of five or ten thousand, as there were understood to be that number of contractors in the country. His reply was that the Association was only open to honest men possessing reasonable resources and qualifications. He urged manufacturers to be careful in their dealings with so-called electrical contractors.

Mr. T. E. ALGER proposed the health of "The Guests."

He said that there was an insistent call for standardisation, but that was impossible without regulations. He considered that safety in the home was of greater importance than safety in factories and mines. He referred to the presence of Mr. P. J. Hannon, M.P., a staunch supporter of private enterprise, and Sir Hugo Hirst, and congratulated Sir Duncan Watson upon his knighthood. The Association was particularly glad to welcome Messrs. Phillips, Robinson and Cramb as representing the I.M.E.A. Mr. Alger paid special tribute to Mr. D. N. Dunlop (B.E.A.M.A.), who had presided over the conferences between the contractors and municipal authorities, and had rendered excellent service.

Sir HUGO HIRST, Bt., in reply, said that although the General Electric Co., Ltd., now had many large departments, it still kept in close touch with contractors through its domestic appliance business, and he welcomed the agreement which had been come to. The future depended to a great extent upon the skill and enterprise of electrical contractors. The latter did not always have sufficient capital to finance big developments, but in conjunction with the supply authorities important work could be carried out.

Mr. P. J. HANNON, M.P., who also replied to the toast, expressed his disappointment at the fact that Col. Ashley had not announced the names of the Central Electricity Board. Although he had opposed the Bill during its passage, he thought that it was now the concern of every citizen to make the Act a workable instrument of progress. It was part of the work of the contractor to cultivate public opinion so as to realise the utmost benefits of the Act. Referring to the manufacturing side, Mr. Hannon said that during 1926 we imported electrical goods to the value of £3,000,000. If our electrical industry had been properly safeguarded against unfair foreign competition, more work would have been available for the industry. Although a protagonist of private enterprise, he recognised that municipal supply authorities had done valuable work.

Mr. R. W. L. PHILLIPS, who also made a response, expressed his appreciation of the work done in the cause of agreement by Messrs. Alger, Cramb and Dunlop.

Mr. W. R. RAWLINGS proposed the toast of "The Electrical Trades Benevolent Institution," and Mr. J. Y. FLETCHER replied.

The proceedings concluded with a toast to the chairman, proposed by Mr. H. J. GALLIERS, to which Mr. Miles briefly responded.

Institution of Electrical Engineers.

Annual Dinner of the North-Western Centre.

THE annual dinner of the North-Western Centre was held on January 18th, at the Midland Hotel, Manchester, the chairman of the Centre, Mr. W. J. Medlyn, presiding. About 270 members and friends were present, and the guests included Dr. W. H. Eccles (president of the I.E.E.), the Lord Mayor of Manchester (Alderman J. H. Swales), the Mayor of Salford (Alderman J. Rothwell), Viscount Wolmer, M.P. (Assistant Postmaster-General), Mr. E. A. Radford, M.P., Mr. E. B. Fielden, M.P., Dr. S. L. Pearce, Col. T. F. Purves, Sir Benjamin Longbotton, and Sir Edwin Stockton.

The toast of the "Cities and Trade of Manchester and Salford" was proposed by Viscount WOLMER, who said the election of Mr. Medlyn to the chairmanship of the Centre was much appreciated as an honour conferred on the Postal Service. The Postmaster-General recognised that it was his duty to do all that lay in his power to help the development and increase the prosperity of British trade, but he was restrained by the shackles put on the Post Office by the Chancellor of the Exchequer. A return to the penny post would give a great impetus to trade, but after the disastrous experience of 1926 that was not within the range of practical politics, and the business community would be well advised to ask instead that the Post Office should give a better service. Earlier and later deliveries of letters would be more beneficial to British trade than the restoration of the penny post, and would cost a great deal less.

The Post Office was giving a vastly better telephone service than existed before the war. During the last few years a notable improvement had been made in the trunk system, and the network of underground cables which this country possessed was not surpassed in any other quarter of the world. It had rendered our telephonic system more nearly immune from weather disturbance than any other system elsewhere. Then there had been the amazing development of telephony across the Atlantic. At present that was confined to communication between London and New York, but it was hoped that within a very short time the Department would be able to put Manchester in telephonic communication with any part of America. Critics had said that such telephonic conversations were likely to be overheard, but their engineers were working at a system which, it was hoped, would result in secrecy.

Cheaper inland telegrams could not be granted, but the development of the beam system had brought the Dominions into much closer touch with this country, and would result, he believed, in a cheaper service and in a greater facility of communication, which must be reflected in the prosperity of British trade.

He expected that further improvement would be made in the telephonic system during the next few years. The Department was building in Salford the largest automatic telephone exchange in the country. This would supply Manchester and Salford with an automatic service second to none in Great Britain.

The toast was replied to by the LORD MAYOR OF MANCHESTER and by Mr. E. B. FIELDEN, M.P., who said that he sat on the Committee which examined the Electricity Bill before it became an Act last session. He had to inquire into the conditions of the supply of electricity, and he was satisfied that Manchester was second to none in that respect. Looking forward to the future, it seemed to him the greatest problem would be transportation in view of the way in which the suburbs of Manchester were growing.

In proposing the toast of the "Institution of Electrical Engineers," Mr. E. A. RADFORD, M.P., said it was very pleasant to be able to refer to any branch of British industry—engineering in particular—as being in a state of prosperity, and that could be said of electrical engineering in the Manchester district.

Dr. W. H. ECCLES, president of the Institution, replied to the toast. He said that of the 13,000 members of the Institution nearly 2,000 were in the North-Western Centre. In the area over which they were distributed were great power stations and factories which made the district a microcosm of the whole electrical industry. There was a saying, "What Manchester thinks to-day England will think to-morrow." To a large extent the saying was true in electrical affairs. About a dozen years ago a Manchester firm partially electrified the Southern Railway, and the same firm had now another large order for that railway company. Manchester was electrifying railways in other parts of the world, for instance, India, at a great pace, but he noticed that it was not doing much in the way of electrifying its own railways. He hoped it would not be long before the whole of the British railways were electrified; the full advantages of electrification could not be got until everybody used electricity. In the Barton station, Manchester had the most efficient generating station in Europe, almost in the world. The number of export orders taken in the last few weeks gave promise of a very rosy future; they were the reward of scientific design and of that untiring energy which appeared to be native to the district. The coal stoppage was over, the Electricity Act was on the Statute Book, and the prospects before electrical engineers, especially in the North-Western Centre, were brighter than they had been for some time.

The toast of "Our Guests" was proposed by the CHAIRMAN, and responded to by Mr. B. MOUAT JONES, principal of the Manchester College of Technology, and Dr. H. Levinstein, president of the Manchester Literary and Philosophical Society.

The Manchester Lighting Service Bureau.

Since the opening of this Bureau in October last a steady programme of lectures has been carried out. Up to date there have been eight lectures, with a total audience of four hundred. These have consisted of the Illumination Design Course, similar to that held in London, and also lectures to the Electrical Contractors' Association, the Electrical Association for Women, and the Electricity Committees of several municipal undertakings in the area. Outside the Bureau there have been thirteen lectures, with a total audience of seven hundred. These lectures have been given to Chambers of Trade, the Mill Managers' Association, and general bodies of the public in Blackburn, Liverpool, Southport, Chorley, Glazebury, and Newchurch. In addition to these, the Bureau provided some demonstrations at the recent electrical exhibition held at Padiham under the auspices of the Lancashire Electric Power Co. A large number of lectures have been arranged to take place both inside and outside the Bureau during the next two or three months. The Electrical Association for Women has arranged to visit the Bureau on a number of occasions, and other audiences will include the Manchester Retail Traders' Association and the Rotary Club of Manchester.

Glasgow Corporation Tramway Supply Account.

At a recent meeting of the Glasgow Corporation Electricity Sub-Committee on Finance, the manager submitted an account against the tramway department, amounting to £8,742, for electricity supplied during the period of the coal dispute, based on the price of coal during that period, which the manager of the tramway department had declined to pay, contending that an equivalent quantity of electricity should be supplied to the electricity department by the tramway department. The manager of the electricity undertaking explained that it would take the tramway department over two years to supply an equivalent quantity of electricity. It was decided that a sub-committee of the tramways should confer with a sub-committee of the Electricity Committee on the matter.

Selected Radio-Telephone Apparatus.

Recent Developments and Improvements.

THE tendency of modern practice is to dispense with accumulators and dry batteries and to derive the power required to operate broadcast radio-telephone receivers entirely off the domestic electricity mains. Should the supply be d.c., no great difficulties are met with, but an a.c. supply present another problem. The anode, or valve-plate, circuit can be energised effectively by means of a "high-voltage" battery eliminator connected to the house mains, which rectifies a.c. in sufficient quantity for the purpose; but a rectifier to provide an adequate output of rectified and "smoothed" a.c. for filament heating would need to be large. It is, of course, possible to connect the filament directly to a.c. mains through a suitable transformer, but such an arrangement often introduces an objectionable hum in addition to the difficulty of obtaining stable grid-bias voltages.

The Novel "KL.1" Valve.

We have received samples of a new valve that has been designed to overcome the difficulties referred to. It is made by the M.O. VALVE CO., LTD., and is marketed under the Marconi and "Osram" names, being an entirely new departure which makes it possible for almost any receiver to be

Fig. 1.—The "K.L.1" Valve with Indirectly-heated Filament.

modified to run entirely off a.c. mains. It is the product of considerable research, and uses a new principle in that the actual filament is not the cathode, and it is not connected electrically to the circuit of the receiver itself. It is operated through a step-down transformer, the primary winding of which is connected to the a.c. mains, without any rectifying or smoothing circuit, and develops a high temperature. To obtain a sufficient supply of heat, the energy consumption has to be approximately seven watts; allowing for a drop in the windings of the transformer, it may be assumed that one kWh of electricity will suffice for 100 hours working. Fig. 1 shows that the electron-emitting cathode (which is surrounded by the grid and anode in the usual manner) takes the form of a small cylinder coated with highly emissive material, which contains within it a "heater element" that is connected directly to the transformer secondary winding. There is no connection between the cathode and "heater element," the former being heated by radiation, thereby acquiring a sufficient degree of temperature to enable it to provide a large electron flow. By this method, with a suitable circuit, all traces of a.c. "hum" are eliminated, it is claimed, and the cathodes of a number of these valves may be joined together in a set to form a common return lead for any number of grid-bias valves, without any fluctuation in grid voltage, such as would be caused by the filament of an ordinary valve if it were connected directly to a.c. supply mains.

In addition to these main advantages of the indirectly-heated cathode valves, scope is afforded by the nature of their internal construction for improved characteristics: internal resistance can be reduced if the cathode and grid diameters are nearly equal; with ordinary filaments it is impossible to do this, but in the KL.1 valve, owing to the cylindrical cathode, a very large surface area is exposed for electron emission, and the above ratio is much nearer unity than it can possibly be in an ordinary valve. This makes the new valve very efficient, and at the same time capable of high amplification without distortion, it is claimed. Several seconds elapse before the valve starts functioning after switching on the heater current; conversely, it continues to amplify for quite a noticeable time after switching off, which phenomenon is due to the time taken for the cathode to reach a sufficient temperature to enable it to emit electrons.

The method of connecting up the new valve is quite simple and straightforward; the cathode is joined to a small terminal on the metal cap, fig. 1, and the two "filament" pins, which are connected to the heater element, require to be wired to the low-voltage secondary winding of a transformer of suitable ratio, fed directly from the a.c. supply mains; a special transformer is obtainable for the purpose, which also feeds the a.c. rectifier for energising the anode. The electrodes are placed at an angle as shown in fig. 1 to prevent the heat emerging from the cylindrical cathode (which is closed at the top, but open at the bottom) from impinging

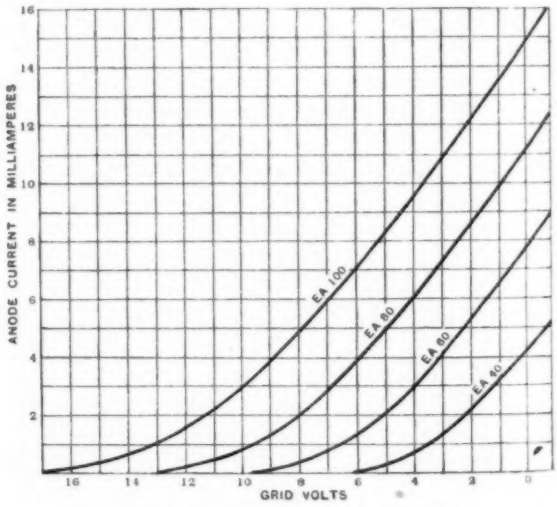


Fig. 2.—Characteristic Curves of the New Valve.

on the pinched foot of the valve. The small disk at the end of the horizontal wire is the "getter"; except for a small patch near the disk, the glass bulb is clear.

The KL.1 valve is suitable for use (1) in h.f. amplifiers when some form of stabilised circuit is employed; (2) as a detector in conjunction with a grid-leak and condenser; and (3) in all stages of transformer- and choke-coupled l.f. amplifiers. Curves of an average KL.1 valve are reproduced in fig. 2; owing to the very large cathode area, the characteristics of the valve are good, and the normal slope of the curve is 1.36 mA per volt, which is very high for a four-volt valve. The impedance is low, being only 5,500 ohms, and at the maximum anode voltage of 100, six volts grid-bias is required. Other data are: heater voltage, 3.5 V; heater current, 2 A; and the amplification factor is 7.5. It is satisfactory to know that the new valve is a British invention.

A Crystal Set Achievement.

By means of a 6-ft. box kite used by Dr. Ellison at the Armagh Observatory, Ulster, for experiments on atmospheric electricity, an unusual reception feat was recently accomplished. Shortly after noon on January 3rd, while the kite was flying at a height of 2,500 ft., the observers received smart shocks from the steel piano wire to which the kite was attached, and strong cracking sparks were drawn from it. The wire was attached to an iron post and earthed, and then connected to a No. 1 crystal receiving set made by the Brownie Wireless Co., which humble instrument enabled the North American broadcast radio-telephone stations to be heard loudly and with ease.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1925.

19,793. "Electric switches." F. B. Cox. August 6th, 1925. (Addition to 240,232.) (262,488.)

21,833. "Apparatus for the purpose of eliminating or reducing interference from atmospheric disturbances during the reception of wireless telegraphic or telephonic signals." J. K. Hele. September 1st, 1925. (Cognate application No. 15,485/26.) (262,496.)

22,029. "Manufacture of vitreous containers for electric lamps, thermionic valves, and the like." A. Emerson, jun. September 3rd, 1925. (262,498.)

22,076. "Telephone systems." Siemens & Halske Akt.-Ges. and K. Hartmann. September 3rd, 1925. (262,499.)

22,244. "Telephone exchange systems." Standard Telephones and Cables, Ltd. (Bell Telephone Laboratories, Inc.). September 5th, 1925. (262,505.)

22,332. "Switch apparatus for use with telephonic receivers." M. Graham and A. Graham (executors of A. E. Graham, deceased). September 7th, 1925. (262,507.)

22,563. "Automatic switches for use in telephone or the like systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). September 9th, 1925. (262,513.)

22,742. "Electric switchgear." British Thomson-Houston Co., Ltd., and H. Trencham. September 11th, 1925. (262,521.)

22,917. "Secondary batteries." J. Stone & Co., Ltd., and A. H. Darker. September 14th, 1925. (262,528.)

23,072. "Bushes, glands and the like for protecting, sealing and bonding electric cables and the like." F. A. Ross. September 16th, 1925. (262,532.)

23,120. "Supersonic heterodyne receivers." Igranic Electric Co., Ltd., and A. H. Curtis. September 16th, 1925. (262,533.)

23,208. "Electric switches, such as used in automatic telephone systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. September 17th, 1925. (262,534.)

23,212. "Electric furnaces." J. K. B. Raeder and Aktieselskabet Raeders Elektro-Glasovn. September 17th, 1925. (262,535.)

23,321. "Electric heaters or vaporisers for use in vaporising the charges of internal-combustion engines." L. E. Aske. September 18th, 1925. (262,540.)

23,589. "High-frequency thermionic valve." Dr. S. Loewe. September 23rd, 1924. (240,455.)

23,846. "Electrochemical processes and apparatus for the extraction of copper and zinc from ores." H. S. Mackay. September 24th, 1925. (Cognate application 27,731/25.) (262,546.)

25,876. "Control systems for electrical apparatus, such as motors." C. T. Scarl, C. H. Last and Metropolitan-Vickers Electrical Co., Ltd. October 16th, 1925. (262,553.)

26,069. "Thermionic valves." H. G. P. Rees and Cleartron Radio, Ltd. October 19th, 1925. (262,555.)

26,760. "Type-printing telegraph receivers." F. McKay. October 26th, 1925. (262,561.)

26,827. "Thermionic valves or electron-discharge tubes, particularly for wireless signalling." Dr. L. A. Levy. October 27th, 1925. (262,563.)

27,528. "Apparatus for providing current for wireless receiving sets from standard electric supply mains." E. K. Cole. November 2nd, 1925. (Cognate application 3,165/26.) (262,567.)

27,882. "Radio signalling systems." Marconi's Wireless Telegraph Co., Ltd. November 6th, 1924. (242,653.)

28,326. "Electric heat radiators." J. C. Vines. November 10th, 1924. (242,679.)

28,884. "Method of reducing inductive disturbances in submarine cables." Dr. U. Meyer. November 15th, 1924. (243,025.)

30,813. "Electric lamps." J. Y. Fletcher and T. J. Sack. December 5th, 1925. (262,593.)

31,215. "Electrical testing." G. F. Shotter. December 10th, 1925. (262,598.)

32,464. "Electric motors." H. Wade (Mills Novelty Co.). December 23rd, 1925. (262,603.)

1,450. "Electric switches." F. B. Cox. October 19th, 1925. (262,698.)

16,081. "Display apparatus of the moving and changing type." F. Pink. June 22nd, 1925. (262,835.)

18,973. "Vibratory systems." Standard Telephones and Cables, Ltd. (Bell Telephone Laboratories Inc.). July 25th, 1925. (262,839.)

20,770. "Electric protective systems." Electrical Improvements, Ltd., and L. C. Grant. August 19th, 1925. (Addition to 216,924.) (262,843.)

22,698. "System of transformation and transmission of electrical energy, applicable, for example, in telephony and telegraphy." G. Musso. September 11th, 1925. (262,847.)

23,084. "Electric furnaces, ovens, and other heating chambers." N. E. North. September 16th, 1925. (262,859.)

23,308. "Power-operated propelling rams for railway or tramway systems." A. G. Kershaw and Westinghouse Brake and Saxby Signal Co., Ltd. September 18th, 1925. (262,867.)

23,342. "Apparatus for electrically indicating or measuring the level or variations of the level of a liquid." C. F. Bornmann. November 20th, 1924. (243,318.)

23,440. "Apparatus for transmitting or reproducing sound." S. G. Brown. September 19th, 1925. (262,869.)

23,473. "Wall-boxes for electrical switches." J. B. Tucker. September 21st, 1925. (262,871.)

23,507. "Modulating system for high-frequency signalling." Standard Telephones and Cables, Ltd., and E. M. Deloraine. September 21st, 1925. (262,872.)

23,633. "Electrical terminals or connectors." J. J. Rowe. September 22nd, 1925. (262,877.)

23,884. "Electron-discharge tubes." Siemens-Schuckertwerke Ges., and R. G. Berthold. September 24th, 1925. (262,879.)

24,409. "Paper insulation for electric cables and the like." Felten and Guilleaume Carlswerk Akt.-Ges. May 8th, 1925. (251,931.)

24,459. "Electric switches." A. C. Wynne. October 1st, 1925. (262,882.)

24,958. "Lead-in tube for wireless apparatus." F. C. Rushton. October 7th, 1925. (262,885.)

25,064. "Electrical terminals." R. C. Turner. October 8th, 1925. (262,887.)

26,181. "Electric switches." English Electric Co., Ltd., and F. N. Linstow. October 20th, 1925. (262,892.)

26,666. "Electric switches." Cable Accessories Co., Ltd., F. H. Reeves, and A. Crawford. October 24th, 1925. (262,895.)

26,878. "X-ray tubes." F. Dessauer. November 16th, 1925. (262,906.)

29,180. "Sockets for holding electric lamps or the like." R. F. Baerman. November 19th, 1925. (262,907.)

29,437. "Telephone transmitters and receivers." M. Graham, E. Graham (legal representatives of E. A. Graham, deceased), and L. H. Paddle. November 21st, 1925. (262,910.)

29,921. "Dirigible headlights for vehicles." T. C. Holliday. November 26th, 1925. (262,915.)

30,567. "Distribution boards for use with wireless receiving sets." W. H. White. December 3rd, 1925. (262,923.)

31,483. "Electric switches." G. C. Lundberg, P. A. Lundberg, and G. Pegg. December 14th, 1925. (262,936.)

31,531. "Electrical indicating apparatus." H. C. Widlake. December 14th, 1925. (262,937.)

31,922. "Telautography or photo-telegraphy." H. C. Batholomew. December 17th, 1925. (262,943.)

32,915. "Machines for making bobbins for electric batteries." H. Wade (Yale Electric Corporation). December 30th, 1925. (262,960.)

1926.

109. "Ventilation of dynamo-electric machines." English Electric Co., Ltd., and F. A. Youngmark. January 2nd, 1926. (262,611.)

1,686. "Supports for electric resistances." H. H. Berry. January 20th, 1926. (262,620.)

2,139. "Wireless receiving apparatus and circuits therefor." A. E. Ball. January 25th, 1926. (262,623.)

2,867. "Apparatus capable of indicating distortion or degree of impurity of wave form of an alternating current." A. Graham, M. Graham (legal representatives of E. A. Graham, deceased), and W. J. Rickets. February 1st, 1926. (262,626.)

7,597. "Electrical ignition devices for internal-combustion engines." R. Bosch Akt.-Ges. June 4th, 1925. (253,076.)

14,688. "Signalling apparatus adapted for giving warning in the event of variation or breakdown in electric circuits." Compagnia Italiana dei Segnali. June 10th, 1925. (253,545.)

15,406. "Wireless telegraphy and telephony." Marconi's Wireless Telegraph Co., Ltd. June 19th, 1925. (253,934.)

17,032. "Brush gear, especially for electric meters and the like." International General Electric Co. Inc. July 7th, 1925. (255,070.)

20,612. "Means for cleaning the dust-depositing surfaces of electric gas-purifying chambers." Siemens-Schuckertwerke Ges. August 21st, 1925. (257,283.)

21,540. "Light projectors." British Thomson-Houston Co., Ltd. September 1st, 1925. (257,933.)

24,054. "Electric resistances for heating elements or the like." General Electric Co., Ltd., A. Kinnes, and J. L. Rycroft. September 29th, 1926. (262,686.)

24,202. "Electrical miners' or like safety lamps." F. Weissenfels. November 23rd, 1925. (261,718.)

25,651. "Means for detecting an earth leakage in high-tension cables." Akt.-Ges. Brown, Boveri et Cie. October 14th, 1925. (259,979.)

901. "Electric wire attachments." A. E. Chapman and C. R. Cook. January 12th, 1926. (262,968.)

1,902. "Electric controllers." International General Electric Co. Inc. January 22nd, 1925. (246 494.)

2,424. "Wireless receiving apparatus using current from the supply mains." W. E. H. Humphrys. January 27th, 1926. (262,979.)

2,651. "Process and installation for producing, simultaneously or successively, light of different colours by means of a discharge tube having positive column light." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 9th, 1925. (247,180.)

4,888. "Method of and means for balancing cables and land lines provided or not with compensating leads and earth cables." H. Tinsley and D. C. Gall. February 19th, 1926. (262,991.)

6,799. "Electrical condensers." Dubilier Condenser Co. (1925), Ltd. March 11th, 1925. (249,133.)

7,895. "Oscillating electric fans." N. W. Gilbert, H. C. E. Jacoby, and A. E. Jabet. March 22nd, 1926. (Cognate application 21,418/26.) (263,003.)

7,932. "Television." C. Baxter. March 23rd, 1926. (263,005.)

9,599. "Electrical power-transmission systems." British Thomson-Houston Co., Ltd. April 18th, 1925. (250,938.)

11,714. "Electric arc welding apparatus." British Thomson-Houston Co., Ltd. May 4th, 1925. (251,672.)

12,104. "Process for the production by electrothermic means of aluminium silicon alloys practically free from carbide." Metallbank und Metallurgische Ges. Akt.-Ges. May 12th, 1925. (262,160.)

12,824. "Electric storage batteries." W. B. Stone. May 19th, 1926. (263,024.)

13,336. "Electric power-transmitting systems." British Thomson-Houston Co., Ltd. May 26th, 1925. (252,721.)

15,263. "Electro-responsive switching devices." British Thomson-Houston Co., Ltd. June 22nd, 1925. (253,923.)

15,740. "Apparatus for sealing wire supports in a glass rod for use in electric lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 25th, 1925. (Addition to 230,431.) (254,311.)

16,232. "Electric heating elements, particularly adapted for cooking ranges and the like." A. J. H. Haddan (Moffats, Ltd.). June 28th, 1926. (263,045.)

17,454. "Apparatus for electrodeposition." International Copperclad Co. August 5th, 1924. (Divided application on 238,230.) (255,113.)

19,130. "Magnetic materials." Standard Telephones and Cables, Ltd. (Bell Telephone Laboratories Inc.). August 18th, 1925. (Divided application on 20,702/25.) (263,059.)

19,505. "High-frequency electric signalling apparatus." Westinghouse Electric and Manufacturing Co. August 6th, 1925 (256,641.)

29,855. "Electric protective systems." Electrical Improvements, Ltd., and L. C. Grant. August 19th, 1925. (Addition to 216,924. Divided application on 20,770/25.) (263,074.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 19th :—

Mellodyne. No. 472,378. All goods in Class 8, but not including loud speakers.—Pollock Bros., 6, Exchange Street, Jedburgh, Scotland.

Majestic (lettering and design). No. 474,235. Class 8. Parts and accessories of radio-telephonic apparatus.—Grigsly-Grunow-Hinds Co., Chicago, U.S.A. (British representatives: White, Langner, Stevens & Parry, 88-90, Chancery Lane, W.C.2.)

Neutrosonic. No. 474,786. Class 8. Instruments and apparatus for use in connection with radio-telegraphy and telephony.—Igranic Electric Co., Ltd.

Petrix. No. 474,894. Class 8. Primary batteries, electric accumulators and parts thereof.—A.F.A. Accumulators, Ltd., 9a, Diana Place, Euston Road, N.W.1.

Mosma. No. 476,054. Class 13. Electric lamps (ordinary).—Moss, Mackay and Co., Ltd., 80, Cannon Street, E.C.4.

Magnet, No. 474,039, and Magnet (design only), No. 474,040. Class 50 Fuse boxes and casing for electric cables, electric insulating material, fittings for lamps (non metallic), &c.—General Electric Co., Ltd.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

BARNET.—49 houses, various sites, for R.D.C.; Arthur Cole, Ltd., Luton.
BARNSLEY.—Waterworks (£350,000); borough waterworks engineer.
BARROW.—Art gallery; Literary Committee of Corporation.
BEDDINGTON CORNER (SURREY).—Conversion of works, New Road, into radio valve factory, for Messrs. Mullard.
BENTLEY (YORKS.).—48 houses; U.D.C. surveyor.
BERWICK-ON-TWEED.—Kinema, café, and shops, Hide Hill; W. Alfred Schofield, for Berwick Theatre, Ltd.
BIDEFORD.—32 houses, Handley Cross, for the T.C.; clerk to the Council.
BIRKENHEAD.—Dock extension scheme for the Mersey Docks and Harbour Board.
BLACKPOOL.—100 houses, South Shore site; Edmondson and Colwell.
BOURNEMOUTH.—Drainage scheme and outfall works (£140,000); borough engineer.
BRADFORD.—New schools (first year programme of a three years' scheme); Bolling Hall secondary (£76,000); Swaine House secondary (£2,250); new Macmillan boys' school (£12,750); elementary schools—Thornbury (£1,050), Bierley (£650), Swaine House (£800); director of education, Town Hall.
CANADA (TORONTO).—Large general store, for the Hudson Bay Co. (several million dollars).
CHIPPENHAM.—Secondary school, for Wilts. E.C.; county architect, Trowbridge.
COVENTRY.—Boiler plant scheme (£12,460), with pumps, &c., for the B.G.; Edwards & Shaw, engineers.
CREWE.—Town central improvement scheme, High Street and Exchange Street; borough engineer.
DERBY.—Laundry (£39,000), for the Midland Co-operative Laundries' Association; secretary, Langley Mills.
DONCASTER.—58 houses at Grange Lane, Rossington, for R.D.C.; W. R. Crabtree, surveyor, Nether Hall. Courthouse, &c. (£20,000); West Riding Standing Joint Committee.
DOUGLAS (I.O.M.).—68 houses, Olympia Estate; J. E. Teare, Corporation architect. Alteration of premises, North Quay; Corlett, Sons & Cowley, Ltd.
ECCLESFIELD (W. YORKS.).—School, Ecclesfield High Green; West Riding County Education Department, County Hall, Wakefield.
ECCLES (LANCS.).—Bazaar premises, Church Street, for F. W. Woolworth & Co., Ltd., Kingsway, London.
EXETER.—102 houses, Buddle Lane; J. Laing & Son, Ltd.
FALMOUTH.—Theatre for Harris Bros.; W. C. R. Corfield.
FARNHAM (SURREY).—Additional 52 houses, for the U.D.C.; surveyor.
FORFAR.—Nurses' quarters at Infirmary (£7,000); Provost Lowson, convener, Extensions Committee.
GLASGOW.—Housing scheme on 200 acres at Carntyne; housing director.
GOOLE.—Railway and wharf; Thorne Colliery and Pease and Partners, Ltd., Darlington.
GOSPORT.—Town wharf reconstruction; borough engineer.
GRAVESEND.—Heating sanatorium, for the T.C.; J. G. Bennett, architect, 4, Woodville Terrace.
HARROGATE.—150 Corporation houses, at Devonshire Place; C. E. Rivers, borough engineer, Municipal Offices.
HAYES.—Extension Gramophone Factory; Wallis, Gilbert and Partners, architects.
HEMSWORTH.—280 houses; R.D.C. surveyor.
HUDDERSFIELD.—Secondary school at Honley; West Riding Education Committee.
INVERNESS.—Additional 100 houses, for the T.C.; burgh surveyor.
KINSLEY (YORKS).—76 houses; Hemsworth U.D.C. surveyor.
LEEDS.—Works, Elland Road, for W. H. Holdsworth, Tallow and Grease Refining Co., Swillington.
LEIGH (LANCS.).—Adapting Pennington Hall as library and museum; borough engineer.
LONDON (WEST HAM, E.).—Extensions, Goodmayes mental hospital, for the T.C.; borough engineer.
(E.C.).—Alteration, City of London School; A. G. Scott, for School Committee.
(CAMDEN TOWN, N.).—Rebuilding Royal Veterinary College (£85,000); Sir John McFadyean, principal.
(REGENT'S PARK, N.W.).—Block of all-electric flats on Abbey Lodge site, Hanover Gate; Ernest Yates, 37, New Bond Street, W.1.
(ST. JOHN'S WOOD, N.W.).—Block of flats, Abbey Lodge site, Park Road; J. Murray, 11, Suffolk Street, W.
(ST. PANCRAS, N.W.).—Tuberculosis dispensary; borough engineer.
LONDON—(*cont.*)—
(BERMONDSEY, S.E.).—Factory for Crosse & Blackwell, Grimscott Street; Messrs. Joseph's.
(LEWISHAM, S.E.).—Kinema, J. Rayman, managing director of the Prince of Wales Playhouse.
(S.W.).—Reconstruction of Oddenino's restaurant, Regent Street (£250,000); Sir Lindsay Parkinson & Co., Ltd.
(BALHAM, S.W.).—Church, Balham High Road; J. S. Watkins. Fifty-five houses, Park Hill Estate; Swain and Selly.
(FULHAM, S.W.).—Additions, Western Hospital, Seagrove Street; W. J. Marston & Son.
(PUTNEY, S.W.).—Additions, Putney Hospital; H. Simmons Bros. L.C.C. school, Magdalen Road; Halliday & Greenwood, Ltd.
(TOOTING, S.W.).—80 houses, Furzedown Estate; E. Clarke and Sons.
(WESTMINSTER, S.W.).—Theatre, Denman Street; E. Laurillard.
(MARBLE ARCH, W.).—Kinema (corner of Edgware Road and Oxford Street); C. Aish, architect.
LONGBENTON.—30 houses, Benton site; U.D.C. surveyor.
LUTON.—Works extensions, Teagrave, for Electrolux, Ltd.
MANCHESTER.—Bazaar premises (five-storey building), Piccadilly, for F. W. Woolworth & Co., Ltd., Kingsway, London.
MIDDLESBROUGH.—Technical college; Education Committee.
NEWBURY.—80 houses; borough engineer.
ORMSKIRK.—Housing scheme (90), for the R.D.C.; R. Rosbotham, surveyor.
QUARRY BANK.—Housing scheme (75), for the U.D.C.; surveyor, Stevens Park.
RADCLIFFE (LANCS.).—Housing scheme (42), Outwood Road, for the U.D.C.; surveyor.
RAMSGATE.—Houses (100), for the T.C.; Grummant Bros., builders, Grange Road.
RICHMOND-ON-THAMES.—Houses, for the T.C.; builders, Craig & Mace, 208, Windsor House, Victoria Street, S.W. (35), and A. W. Folsham, 37, Sheen Road (28). Twenty flats, for the British Legion Poppy Factory, Ltd.; D. Wood, architect. Corporation housing scheme (63); Messrs. Cory & Cory and Mr. R. Dixon.
ROTHERHAM.—Technical and art schools, and four elementary schools (£140,000), for the borough E.C.; director of education.
SEDGLEY.—Sewage scheme and pumping plant (£29,000); W. Willcox, for the U.D.C.
SHEFFIELD.—Fire station, Rockingham Street (£42,000); city engineer. Waterworks (£160,000); water engineer.
SOUTHEND.—Kinema for Warrior Square Picture Theatre, Ltd.; Barles, Harris & Collings, architects.
STAFFORD.—Further 58 houses, Tithe Barn Estate; W. Plant, borough engineer.
STOCKTON.—Isolation hospital; borough engineer.
STRETFORD.—Extensions, cable shop, Warwick Road North; W. T. Glover & Co., Ltd. Warehouse and offices, Talbot Road; Crittall Manufacturing Co., Ltd. 84 houses, Hancock Street; U.D.C. surveyor.
SWANSEA.—Reconstruction of flour mills, Beaufort Dock; Weaver & Co., Ltd. Isolation hospital, Hellhouse (£84,000); borough architect. Reconstruction High Street Railway Station; G.W.R.
THORNE (YORKS.).—Houses (98), for Leadley, Firth and Whittington, Ltd.
TOTTINGTON (LANCS.).—Housing scheme (72), for the U.D.C.; surveyor.
TROWBRIDGE.—Conversion of Adcroft House into hospital; Cottage Hospital Committee.
URUGUAY (MONTEVIDEO).—Proposed National Freezing Works ($3,000,000); State Executive.—*Reuter's Trade Service* (Montevideo).
WAKEFIELD.—Deeds registry, Bond Street (£10,500); J. R. White, county architect, West Riding.
WALLASEY.—Motor-'bus garage; borough engineer.
WATH-UPON-DEARNE (YORKSHIRE).—108 houses for U.D.C. at West Melton; Tennant & Smith, architects, Ropergate Chambers, Pontefract.
WHITWOOD.—Mining institute (£40,000); Miners' Welfare Committee and West Riding Education Committee.
WOLVERHAMPTON.—Completion of joint technical college (over £100,000); J. A. Warren, Director of Education.
WORSLEY (LANCS.).—Additional housing scheme (50), Walkden estate, for the U.D.C.; surveyor.
WREXHAM.—Additional 100 houses, for the T.C.; borough surveyor.